LifeWatch ERIC

activity report '24

lifewatch.eu

LifeWatch ERIC

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LifeWatch ERIC

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View from Kobariški Stol in the direction of Starijski vrh shows steep slopes with undisturbed alpine meadows, a paradise of biodiversity. Picture taken on the mighty Kobariški stol mountain, which separates the Soča and Nadiža valleys in the Slovenian Julian Alps. Photo by Tomi Trilar, Slovenian Museum of Natural History (LifeWatch Slovenia).

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Foreword

Vladislav Popov

Vice Chairperson of the General Assembly

LifeWatch ERIC has shown both strength and agility in supporting emerging policy frameworks, such as the Kunming-Montreal Global Biodiversity Framework and the forthcoming EU Restoration Law, by providing actionable data and innovative digital solutions.

A Year of Growth and Strategic Momentum

From biodiversity research to open science and global policy support — LifeWatch ERIC's expanding role across Europe and beyond.

The year 2024 marked a period of growth, consolidation, and fresh momentum for LifeWatch ERIC. As the new Chairperson of the General Assembly, I am proud to witness the continued evolution of this unique European Research Infrastructure as a vital enabler of biodiversity and ecosystem research across our Member States and beyond.

This past year, thanks to the contributions of our Distributed Centres and Common Facilities, the efforts of the Executive Board, and the contributions of the user community, we sharpened our focus on strategically integrating scientific domains, strengthening transnational partnerships, and delivering FAIR and open science research products. LifeWatch ERIC has shown both strength and agility in supporting emerging policy frameworks, such as the Kunming-Montreal Global Biodiversity Framework and the forthcoming EU Restoration Law, by providing actionable data and innovative digital solutions.

We have also expanded our collaboration to enhance LifeWatch ERIC's contribution to the European Open Science Cloud (EOSC), while beginning to align our capacities with the United Nations' One Health vision, an ambitious yet vital endeavour that will shape the years to come.

Looking ahead, we remain committed to fostering excellence in science and innovation, supporting long-term sustainability, and ensuring the voice of Research Infrastructures remains strong in the broader European Research Area (ERA). On behalf of the General Assembly, I would like to thank our member countries, scientific partners, and dedicated staff for their continued trust and collaboration.

Foreword

Christos Arvanitidis

LifeWatch ERIC CEO

LifeWatch ERIC stands ready to lead with clarity of purpose, an ethos of collaboration, and a firm commitment to innovation.

Advancing Science Through Innovation and Collaboration

A transformative year marked by technological progress, strategic partnerships, and a shared vision for tackling global biodiversity challenges.

This year has been transformative for LifeWatch ERIC. We have made significant progress toward our mission of enabling cutting-edge science and technology in the field of biodiversity and ecosystem science underpinned by strategic consolidation and strengthened through meaningful partnerships.

We focused our efforts on strengthening our core services: developing advanced Virtual Research Environments (VREs), launching innovative data mobilisation tools such as LifeWatch ERIC Search, and expanding our Data Lake infrastructure capabilities. Our growing research communities benefited from tailored training initiatives and collaborative knowledge-sharing events that bridge borders among research disciplines and domains.

Importantly, we continued to align our technological roadmap with the pressing challenges of our time. From biodiversity monitoring and ecosystem restoration to species forecasting, now increasingly powered by artificial intelligence and high-throughput data streams, LifeWatch ERIC is establishing itself as a key actor in delivering actionable, integrated science.

In parallel, we are cultivating our "trading zones" with other Research Infrastructures, building on our complementarities and synergies to support the global policy agenda, particularly the Kunming-Montreal Global Biodiversity Framework, the One Health approach, and the European Open Science Cloud (EOSC).

As we prepare to enter a new implementation cycle, LifeWatch ERIC stands ready to lead with clarity of purpose, an ethos of collaboration, and a firm commitment to innovation. Our belief is that the value of this infrastructure is ever more deeply rooted, as is the engagement of our Distributed Centres, whose joint efforts continue to create added value.

On behalf of our Executive Board, I extend my sincere thanks to all our collaborators, from researchers and technical teams to institutional partners and funders. Your dedication is the foundation of our progress, and the driving engine of our shared future.

About LifeWatch ERIC

Vision

The vision behind LifeWatch ERIC is to become the Research Infrastructure providing access to the world's biodiversity content, services and communities in one click.

Core Business

The core business of the LifeWatch ERIC infrastructure is the construction of virtual "workbenches" with e-services that allow its user communities to analyse patterns and trends in biodiversity in space and time, its (natural or man-made) drivers and the impacts on ecosystems.

Mission

LifeWatch ERIC aims to accelerate the research efforts of the scientific community by delivering a European state-of-the-art e-Science Research Infrastructure on biodiversity and ecosystem research: a Digital Twin which

- provides access to, and support for, key scientific services by applying cutting-edge ICT technology,
- enables reproducible analytics,
- is co-designed and co-created with the user communities, and
- is tuned with the needs for research that provides key insights for society, in particular science-based policy.

Value proposition

Overall value proposition: LifeWatch ERIC provides scientists and other users with access to biodiversity and ecosystem data, services and other research products by using and contributing to its advanced infrastructure to derive evidence-based knowledge for scientific and policy purposes.

The yarrow *(Achillea abrotanoides).* Picture taken in Cogne, Valnontey area, Paradisia Alpine Botanical Garden, in Aosta Valley, Italy.

Our History

Figure 1. LifeWatch ERIC's timeline

The Strawberry Tree *(Arbutus unedo)*. Picture taken in Moneglia, along the Ligurian Trail towards Punta Baffe, Liguria, Italy. Photo by Andrea Moro (License: https://creativecommons.org/licenses/by-sa/4.0/), original: https://dryades.units.it/dryades/plants/foto/P4600185JPG1578481609.jpg

What we do **for you**

Researchers

LifeWatch ERIC provides access to vast and diverse biodiversity data repositories, specialised analytical services, customisable workflows, Virtual Research Environments and other research products, promoting national scientific research and innovation.

Collaboration and Knowledge Sharing: LifeWatch ERIC's network supports scientific collaboration at national, regional and international levels, by connecting **researchers** from multiple disciplines and domains of science, removing the barriers between them and promoting the resulting knowledge: the synthetic knowledge.

Examples of application

Invasive Species Management: Data analysis and modelling of species invasion in relation to changing climatic conditions, and their ecological impacts, allow to forecast the spread of invasive species and suggest mitigation measures, inform policies for targeted prevention and control measures, minimising economic loss and preserving biodiversity.

Ecosystem Health Monitoring: LifeWatch ERIC's integrated data management solutions allows to model ecosystems in response to various drivers of change and environmental stressors (e.g., pollution and eutrophication, land use changes, overharvesting, climate change and invasive species) to provide insights to policymakers to assess ecosystem health, creating actionable steps for resource allocation, conservation zones, or habitat restoration initiatives and guide their decisions.

Climate Resilience Planning: Researchers using LifeWatch ERIC can simulate how ecosystems will respond to different climate scenarios. These models provide policymakers with specific information and knowledge on potential risks, enabling them to prepare adaptive strategies that support both biodiversity and human communities, such as coastal defence initiatives in vulnerable areas or drought-resistant agriculture.

Policymakers

LifeWatch ERIC provides **policymakers** with open access to high-quality biodiversity and ecosystem data, models, and other research products, enabling them to make evidence-based decisions. It aligns with EU and international strategies like the Green Deal, Biodiversity Strategy 2030, and the Strategic Development Goals (SDGs), fostering collaboration across sectors, ensuring environmental policies are grounded in science. It supports long-term sustainability goals through its Virtual Research Environments (VREs) and commitment to FAIR and open science principles.

Private Sector

LifeWatch ERIC teams of engineers and scientists are available to work with the **private sector** companies to design and provide access to digital solutions for biodiversity and ecosystem research such as biodiversity data repositories, customised analytical services, workflows, Virtual Research Environments, and other research products.

The Hooknose (*Agonus cataphractus*). Picture taken during a fish SeaWatchers survey. Photo by Bram Conings

LifeWatch ERIC
as an organisation

A robust and responsive organisational structure is a cornerstone of **LifeWatch ERIC's capacity to deliver on its strategic mission**. This structure ensures alignment across the full lifecycle of activity: from planning and coordination to operational management, performance monitoring, and **impact assessment.**

In 2024, LifeWatch ERIC underwent a comprehensive evaluation by the European Strategy Forum on Research Infrastructures (ESFRI). The conclusions of the Monitoring Panel were strongly positive, highlighting that:

"Overall, LifeWatch ERIC demonstrates strong operations and receives positive feedback on its KPIs, many of which exceed targets."

In line with its commitment to **continuous improvement and accountability**, LifeWatch ERIC has taken proactive steps to respond to the panel's recommendations. The **Executive Board has launched the development of a targeted implementation plan** to address all comments and suggestions raised in the evaluation report. This ensures that LifeWatch ERIC remains a trusted, high-performing infrastructure aligned with the expectations of European research and innovation policy.

Governance

LifeWatch is a legal entity of eight European Union Member States that form a distributed research infrastructure consortium, an ERIC: Belgium, Bulgaria, Greece, Italy, the Netherlands, Portugal, Slovenia, and Spain. Its members operate from national entities known as Distributed Centres, while its Common Facilities are located in three Member States: Spain (Statutory Seat Office and ICT core), Italy (Service Centre), and the Netherlands (Virtual Laboratories and Innovation Centre - VLIC).

Statutory bodies

The General Assembly is the highest governing body of LifeWatch ERIC. Composed of representatives from all member states, it is responsible for the overall direction and supervision of infrastructure activities. The General Assembly recommends the policies and internal rules necessary for the smooth functioning of LifeWatch ERIC.

The Executive Board is responsible for the day-to-day management of the infrastructure and ensures its consistency, coherence, and stability. The Board also coordinates the Common Facilities and Distributed Centres.

Subsidiary bodies

The **Scientific and Technical Advisory Board** (STAB) makes recommendations regarding the scientific, technical, and ethical quality of LifeWatch ERIC activities.
The **In-Kind Contribution Committee** (IKCC) addresses in-kind contribution-related matters and carries out in-kind contribution evaluation.

The **Financial Committee** (FINCOM) makes recommendations to the General Assembly regarding LifeWatch ERIC's financial management and adherence to the Financial Rules.

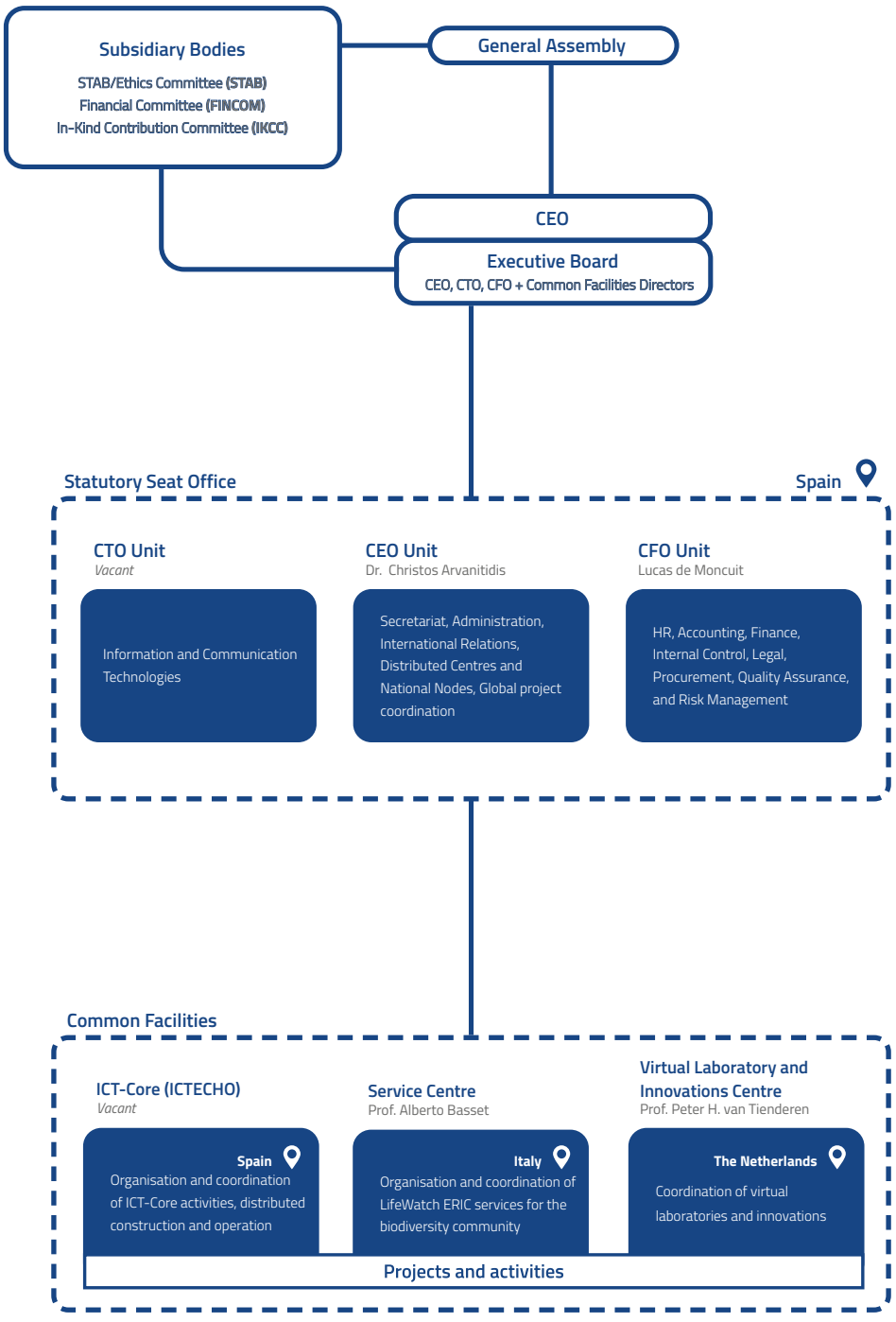


Figure 2. Governance scheme

The Mute Swan (*Cygnus olor*). Picture taken in winter at Lake Cerknica, one of the largest intermittent lakes in Europe, located in central Slovenia. Photo by Tomi Trilar, Slovenian Museum of Natural History (LifeWatch Slovenia).

CEO
Christos Arvanitidis

- General Assembly & Research Infrastructure Committee Support — Giovanna Caputi
- Scientific Project Coordination & Executive Board Support — Cristina Huertas
- Scientific Project Coordination Support — Maite Irazabal

CTO
Vacant

- LwOS & IT Support — Rocío Montero

CFO
Lucas de Moncuit

- Project Management
  - Global Project Management — María Pérez
  - Project Management — Ana Bajandas
- Central Services
  - Finance — Javier Sáenz
  - People & Culture Management — Elena Delgado
  - Quality Assurance & Risk Management — Hooi Sung / Rocío Montero
  - Procurements — Javier López

ICT-Core Director
Vacant (currently under CEO Responsibility)

- ICT-Core Operations — Antonio J. Sáenz, Francisco Sánchez, Joaquín López
  - Architecture — Adrián Guerrero
  - Physical infrastructure — Emilio Jara
  - Networks, providers, sensors, IOT/Data Gathering — Francisco Sánchez
  - Single Sign On/Workflows — Julio López
  - LifeBlock — Joaquín López
  - Data Engineering — *Vacant*
  - Development — Pablo Santos, José Zaño
- Project Scientific Coordination
  - Scientific Project Management — José Manuel Ávila, Iria Soto, Ana Mellado, Xavier Rotllan
- Project Management — Mariela Pino
  - Fundraising & proposal writing — Javier Saura, Mariela Pino
  - Project Management — Javier Saura, Mariela Pino

Virtual Laboratory & Innovation Centre Director
Peter van Tienderen

- VREs — Zhiming Zhao
  - Development — Gabriel Pelouze, Spiros Koulouzis, Koen Greuel
- Project Management — Jacco Konjin

Service Centre Director
Alberto Basset

- Project Management — *Vacant*
  - Help Desk & Technical Support — Pierluigi Calasso
- Finance & Admin — Eleonora Romano
  - Administrative Support — Irene Matteo
- Training
  - Training — Cosimo Vallio
  - EU Project Training — Eleonora Parisi
- Communications — Sara Montinaro
  - EU Project Communication — Madeira Scauri
  - Digital Communication — Cristina Mancarella
  - Science Communication — Laura Caciagli
- Scientific Community Networking
  - Scientific Community Networking — Ant Turkmen
  - EU Project Scientific Community Networking — Vanessa Marrocco
- ICT — Lucia Vaira
  - Data Science — Eftychia Tzafesta
  - Web Portal — Majid Fiaz
  - Semantics — Parham Ramezani

Figure 3. Organisational Chart

Employment Structure

At the end of the year, LifeWatch ERIC counted **47 employees** working within the organisation and stationed in its three Common Facilities, consisting in **15% scientific staff**, and **35% technical staff (ICT)**. Looking at the gender dimension, it emerges that **44% of the workforce is composed by female personnel**, with this percentage further growing in working areas such as Project Management, Administration, and Communication, and decreasing in ICT and Top Level Management positions.

The organisational chart of LifeWatch ERIC (fig. 3) shows how the various teams are structured, the members that compose each team and where they work.

Over the year, LifeWatch ERIC has consolidated the People & Culture Management area across the whole organisation by defining and implementing common policies, procedures and guidelines, that materialise the Culture Principles of LifeWatch ERIC, while taking into account the specificities of each national context labour framework. In parallel, HR processes were streamlined boosting overall security and accuracy of information, thanks to the introduction of dedicated digital tools for the integration of personal data, time tracking, and management of staff requests.

For this purpose, the following policies, procedures, and guidelines were introduced:

- Compensation Policy,
- Procedure for Recruitment,
- Protocol for prevention and action in case of harassment at work,
- Work-life balance guidelines,
- Digitalisation of personnel information, as well as other procedures for leaves, time tracking, etc.

The revision of the **Gender Equality Plan (GEP)** was initiated in the 3rd quarter of 2024 thanks to the establishment of the LifeWatch ERIC Gender Equality Committee. This group is formed of four volunteer members, one from each Common Facility, holding different roles within the organisation, belonging to different age groups and ensuring balanced gender representation. The GEP Committee created a space for dialogue and fluid communication, so that all decisions, recommendations and actions are taken in agreement with the organisation.

The Gender Equality Committee is responsible for the definition of the revised GEP objectives, the development of its measures and monitoring of its implementation status.
The revised version of the GEP will be delivered in the second quarter of 2025.

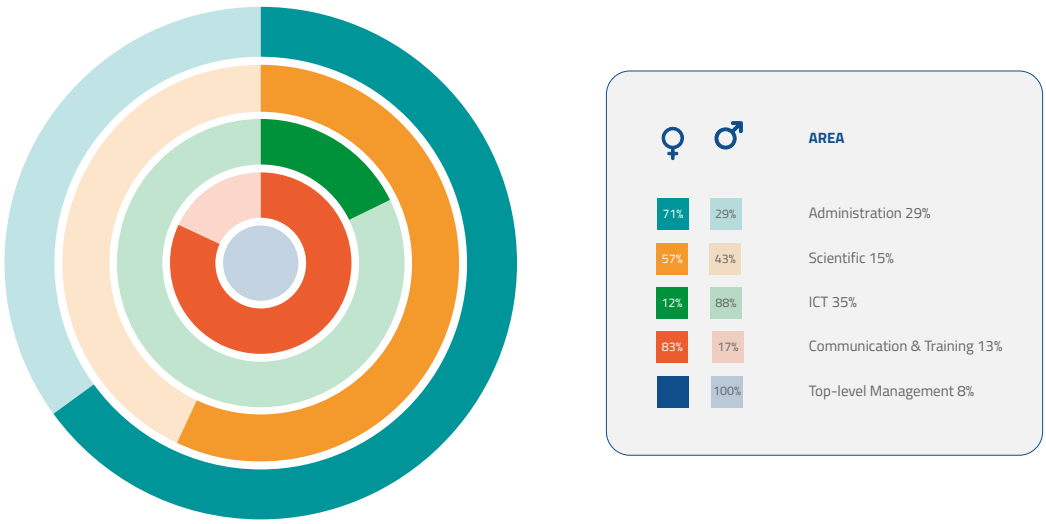
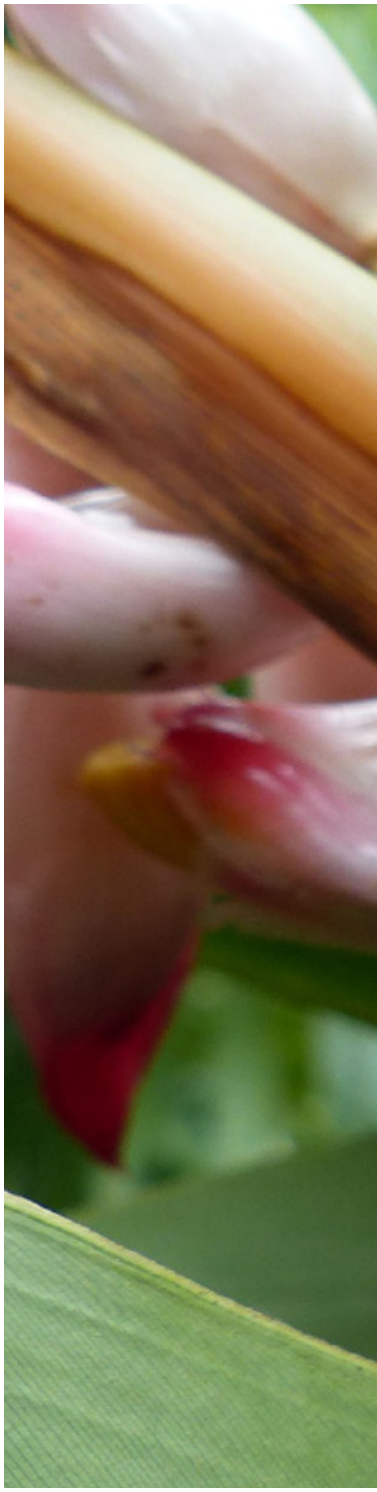


Figure 4. Female and male distribution per working area

Strategic Working Plan Implementation Progress

The LifeWatch ERIC Strategic Working Plan (SWP) defines the activities the infrastructure will undertake until 2026 to achieve its strategic objectives. To support this, an Actionable Roadmap (ARM) was developed as a key tool to align specific elements of the SWP with strategic and operational objectives, priorities, tasks, and related activities. The ARM facilitates progress tracking through deliverables and Key Performance Indicators (KPIs) while also identifying and mitigating potential risks. Serving as a primary implementation and monitoring system, the ARM provides a real-time overview of all ongoing and future activities.

By the end of 2024, **the implementation level has surpassed 40%**, with 16 deliverables completed and officially released at that time and multiple others submitted and pending review, demonstrating significant progress in achieving LifeWatch ERIC's strategic objectives.



Quality Assurance and Risk Management

On June 1, 2024, the LifeWatch ERIC Executive Board (EB) members held the fourth Management Review Meeting (MRM) in Seville, following the LifeWatch ERIC´s procedure for MRM. This meeting played a key role in strengthening LifeWatch ERIC´s management system, driving critical improvements, and ensuring the organisation effectively meets the needs and expectations of all stakeholders.

One of the key elements is the Document Management System (DMS) whose role is to allow the management, version tracking and accessibility of controlled information and documents in line with regulatory requirements and the principle of operational excellence. During 2024, a total of 15 Management System documents and 30 supporting documents were released.

Risk management is a fundamental element of LifeWatch ERIC quality management strategy. By integrating risk management into the decision making process, the Executive Board ensures that proper measures are taken to reduce the likelihood and or impact of potential threats before they occur. The Strategy for Risk Management and the Risk Register form the backbone of the Risk management framework of LifeWatch ERIC.

To ensure operational excellence, continuous improvement and regulatory compliance, LifeWatch ERIC has developed a procedure to evaluate the effectiveness of the Management System, identifying areas for improvement and ensuring alignment with established policies, strategies, rules and procedures. Non-compliance or opportunities for improvements identified during internal audits or other monitoring activities are managed through a structured approach following a procedure for non-compliance management.

The Shell Ginger (*Alpinia zerumbet).* Picture taken at the Botanic Garden (QSBG) Mueang Chiang Mai, Thailand.
Photo by Andrea Moro (License: https://creativecommons.org/licenses/by-sa/4.0/), original: https://dryades.units.it/dryades/plants/foto/TS207811.jpg

Finances

After experiencing difficult conditions from 2021 to 2023, the financial year 2024 marked the return of the organisation to a stable situation, giving it a sound financial basis to pursue its mission.

Piloting the organisation in a context of ever increasing costs and limited financial resources requires access to reliable financial information preferably in a fast way. For this reason, the Executive Board has continued developing the accounting, financial and project management frameworks allowing a data-driven decision-making process, while also actively promoting the diversification of incomes through participations in strategically important EU projects from the Horizon Europe and Horizon 2020 programmes.

LifeWatch ERIC's consolidated Financial Statements are audited, each year, by an external auditor and then submitted for approval to the General Assembly, while external projects are subject to independent auditing according to specific legal requirements. The Financial Statements of 2024 are provided at the end of the Annual Report.

The Red Fox (*Vulpes vulpes*). Picture taken at the Ljubljana ZOO in central Slovenia.
Photo by Tomi Trilar, Slovenian Museum of Natural History (LifeWatch Slovenia).

LifeWatch ERIC
as an infrastructure

LifeWatch ERIC is upgrading its infrastructure to transform its prototype into next-generation infrastructure for biodiversity and ecosystem research. This upgraded infrastructure will maximise production, meet quality standards, and address the needs of projects, communities, individual scientists, and developers.

Scientific Excellence

LifeWatch ERIC plays a vital and unique role within the European Strategy Forum on Research Infrastructures (ESFRI) as the only European e-Science Research Infrastructure dedicated exclusively to biodiversity and ecosystem research. Its work supports national, European, and global environmental and sustainability agendas by addressing the inherent complexity of biodiversity systems, shaped by geological, physical, chemical, biological, and socio-economic factors.

Through its digital infrastructure, LifeWatch ERIC enables integrated research across all levels of biological organisation, from genes to ecosystems, and across spatial, temporal, and functional scales. It provides researchers and institutions with access to interoperable data, advanced tools, and analytical platforms to generate evidence-based knowledge that directly informs environmental governance, conservation policy, and sustainable development.

2024 Achievements: Technology, Access, and Knowledge Integration

In 2024, LifeWatch ERIC significantly expanded its scientific and technical capabilities by:

- Enhancing its suite of research products, by adding new datasets, analytical services and workflows within its Virtual Research Environments (VREs).
- Upgrading core digital infrastructure, including the foundational Metadata Catalogue, the EcoPortal (to strengthen semantic interoperability), and the Biodiversity Knowledge Hub (BKH).
- Launching the LifeWatch ERIC Search service, which, supported by blockchain technologies, offers streamlined access to metadata from sixteen data repositories and global aggregators, covering data ranging from taxonomic and phylogenetic, to genomic, biological and trait data.
- Improving Internet of Things (IoT) capabilities, with upgraded sensor platforms and LifeWatch ERIC-developed data loggers that transmit field data to the infrastructure's Data Lake, while enabling full remote sensor management via a dedicated user interface.

These technological advancements enhance LifeWatch ERIC's ability to support researchers in monitoring environmental change, improving their research efficiency, and facilitating rapid, secure, and scalable data, knowledge and innovation sharing for the benefit of policy development and implementation (*technological push*).

Scientific Engagement and Policy-Relevant Research

To align its services with evolving scientific and policy needs, LifeWatch ERIC launched six Thematic Services Working Groups focused on priority areas of biodiversity and ecosystem research. These groups, established through expert workshops and consultations, aim to:

- Co-design tailored e-services with scientific communities,
- Generate actionable insights in areas such as climate resilience, invasive species, and habitat dynamics,
- Promote *synthetic knowledge* generation by integrating evidence across disciplines using VREs (*scientific pull*).

Demonstrated Impact Through Scientific Output

LifeWatch ERIC's scientific impact continues to grow. In 2024, publications referencing the infrastructure increased by 41%, with three-quarters appearing in peer-reviewed journals. Notably, over one-third of these publications were featured in top-tier international journals in biodiversity and ecology, further affirming LifeWatch ERIC's relevance to cutting-edge research and its potential to high-level policy discourse.

e-NEEDS

LifeWatch ERIC prioritises the creation of FAIR (findable, accessible, interoperable, and reusable) resources within the broader landscape of research infrastructures and the implementation of robust data management strategies. The ERIC seeks to elevate the standards of resource accessibility and management ensuring that scientific data is not only discoverable and accessible, but also interoperable and open to be reused. Moreover, the FAIR principles are also guaranteed to other LifeWatch ERIC products. Upgrades of both Metadata Catalogue and EcoPortal were ongoing over the year and will be released in 2024, but the final release is for 2025, both featuring a new tool to evaluate the FAIRness of a single metadata record, the catalogue itself and ontologies.

Infrastructure provisioning and management services have been deployed on the hardware of five distributed and federated data centres (which includes not only traditional CPUs, RAM, and hard drives, but also GPUs and AI), featuring distributed virtualisation and application service container management platforms. A multitude of end-user services and service components were and are being deployed, enabling LifeWatch ERIC to provide tools for federated searches, workflow composition and validation, Virtual Research Environment composition, data sensor management, storage, provenance, neural network training and inference, and ongoing geographic information systems.

LifeWatch ERIC leverages several tools for IT monitoring and observability enabling: real-time monitoring of servers, networks, and security, alerting teams before issues impact users (Zabbyx); collection of performance metrics (e.g., API latency, database load) for deep analysis (Prometheus); identification of usage trends; and transformation of data into intuitive dashboards (Grafana). This resulted into faster problem resolution, cost optimisation, and improved performance, turning raw data into actionable insights.

In parallel, LifeWatch ERIC has developed a modular and interoperable stack of services connecting physical sensor networks with cloud-based data processing and publication layers. This integrates secure data acquisition, real-time ingestion (via MQTT, IoT Agents, Kafka), transformation workflows (NiFi, GeoEvents), and open-access publication (SOS, GeoServer, CKAN), all deployed across federated infrastructures. The resulting architecture enables end-to-end data flow (from field measurement to user-facing services) ensuring scalability, reproducibility, and long-term sustainability.
LifeWatch ERIC is one of the thematic pilot nodes of the EOSC Beyond project, where the federation with core services like AAI, Resource Catalogue and Help Desk will take place.

LifeWatch ERIC is advancing key innovations in European projects by developing pilots and tools that support biodiversity research and data management (e.g., the thematic pilot node in EOSC Beyond to foster the federation and interoperability among Research Infrastructures; the MARBEFES Toolbox to assess marine biodiversity and ecosystem services; etc.).

The table at the following pages lists all LifeWatch ERIC services released or upgraded in 2024. Some are open to everyone; others, such as MyLifeWatch, require login via LifeWatch ERIC free EOSC-federated Single-Sign-On (supporting dozens of identity providers). First-time sign-in grants a basic authorisation level; to gain advanced functions or use any service labelled "**Access restricted**," users must request an upgrade through the **LifeWatch ERIC Helpdesk**.

View of the slopes of Monte Grisa. Picture taken in the sourroundings of the Santuario Mariano, Trieste, Italy.
Photo by Andrea Moro (License: https://creativecommons.org/licenses/by-sa/4.0/), original: https://dryades.units.it/dryades/plants/foto/TS114500.jpg)

Research product	Short description
Ecoportal	The new version of the semantic repository includes several new functionalities (Single-Sign-On, ontologies browsing across multiple federated portals, FAIRness evaluator, performance improvements, bug fixes, user interface upgrades, etc.).
MyLifeWatch	An aggregation portal for the variety of final user service components.
Statistic Platform	Restricted access platform to monitor the infrastructure and to analyse performance and user behaviour.
Federated and AI-assisted search	Simultaneously search across multiple data providers in a federated manner with aggregated and cross-referenced results.
NaaVRE platform as a service	In 2024, the architecture of NaaVRE PaaS has been refined, and new interface for integrating external services (AAI and R/C++ containerisation) have been incrementally deployed.
LifeWatch Green Devices Platform	Manage, configure, and monitor environmental IoT devices, supporting real-time communication, data visualisation, and research team coordination.
LifeWatch FIWARE/FIWOO Platform/Datalake	Manage environmental data flows and digital twins through the LifeWatch ERIC FIWARE/FIWOO Platform, using an environmental datalake and NGSI-compatible IoT agents for real-time data contextualisation.
INSPIRE & OGC Data Validation Service	Manual validation environment to assess compliance of geospatial data and metadata with INSPIRE and OGC standards. It supports quality control prior to publication in federated infrastructures such as GeoNetwork or GIS services.
LifeWatch Sensor Observation Service (SOS)	Standardised access to time-series data from environmental sensors. It integrates observations from LifeWatch ERIC dataloggers and external providers, supporting real-time analysis and long-term monitoring.
LifeWatch LifePortal	New instance of GeoNetwork designed to be federated with the main Metadata Catalogue. It ensures compliance with heterogeneous metadata standards and supports integration with external data providers, such as REDIAM (Environmental Information Network of Andalusia, Junta de Andalucía). It facilitates standardised discovery and access to environmental datasets.
Hybrid ArcGIS-OpenGIS Architecture	ArcGIS and open-source components (e.g., GeoServer) to enable interoperable and scalable geospatial services. It supports long-term sustainability and flexibility in environmental data publishing.

	URL	Reference to documentation (training, technical, etc)	New product/ upgrade
	Access	User Guide	Upgrade
	Access	N/A	Upgrade
	Access	N/A	New product
	Access	N/A	Upgrade
	Access	Tutorials	Upgrade
	Access	N/A	Upgrade
	Access	On demand	Upgrade
	Access	N/A	New product
	Access	N/A	New product
	Access	N/A	Upgrade
	Access	On demand	Upgrade

Research product	Short description
LifeWatch ArcGIS Geoportal	Web-based platform for exploring, visualising, and downloading geospatial data. It includes environmental data produced by the Sierra Nevada National Park sensor network prototype.
LifeWatch GIS Viewer	Enable direct access to environmental datasets and spatial analyses through a web-based viewer to explore, overlay, and interact with geospatial data layers and OGC services (e.g., WMS, WFS) published within LifeWatch ERIC.
FAIR Data Management Support	Support for planning, curating, and publishing research data according to the FAIR principles, including assistance with Data Management Plans (DMPs).
Second Level Service Desk Platform	Special users and collaborators use it to solve their issues with our platforms. Standard users should use helpdesk.lifewatch.eu.
Abiotic Sensor Network in Sierra Nevada National Park	Physical network of 50 environmental monitoring stations equipped with abiotic sensors focused on climatological variables. Deployed across diverse ecosystems in the Sierra Nevada National Park, the network provides *in-situ* data to support ecosystem research, climate analysis, and long-term ecological monitoring.
Firmware Release 1.6.1 for LifeWatch Dataloggers	New firmware version released for LifeWatch dataloggers, improving stability, communication protocols, and data management. This upgrade was developed based on field observations and feedback from the sensor prototype deployed in the Sierra Nevada National Park.
MQTT Communication and Remote Device Management Services	Internal service enabling real-time data transmission and remote configuration of dataloggers using MQTT/ Mosquitto. Includes IoT Agents for translating device protocols into NGSI for integration with the FIWARE ecosystem.
LifeWatch IoT Agent Suite	Set of protocol-specific IoT Agents that mediate between physical devices and the FIWARE platform. It includes agents for JSON, LoRaWAN, Sigfox, and Ultralight protocols. The IoT agents normalise incoming data into NGSI format, enabling seamless integration with the context broker and downstream processing.
Kafka Integration Service	Internal service for integrating external sensor data streams (e.g., from regional authorities) into the datalake. It enables real-time distribution of data based on predefined processing agreements with providers, such as the Andalusian Regional Government.
FIWARE NGSI API for Sensor Data Access	RESTful API based on FIWARE NGSI standards, enabling programmatic access to sensor data stored in the datalake. It supports external data extraction, integration with third-party applications, and advanced data analysis workflows.
Apache NiFi Data Flow Management Service	Service for orchestrating and automating data flows from IoT Agents and external sources to the data lake. It supports data filtering, transformation, routing, and scheduling in a scalable and modular way.

URL	Reference to documentation (training, technical, etc)	New product/ upgrade
Access	On demand	Upgrade
Access	On demand	Upgrade
Access	N/A	Upgrade
Access	N/A	New Product
N/A physical infrastructure	Technical documentation under development	Prototype
N/A embedded system component	Internal technical documentation available for deployment and configuration	Upgrade
Access restricted	Technical documentation under development	Upgrade
Access restricted	Technical documentation under development	Upgrade
Access restricted	Technical documentation under development	New product
Access restricted	Internal technical documentation available for service administration and development purposes	Upgrade
Access Access restricted	Internal technical documentation available for service administration and development purposes	New product

Research product	Short description
LifeWatch GeoEvents Service	Internal service for processing and transforming raw data from the FIWARE platform into standardised formats for SOS and GIS consumption. It supports environmental data integration into the datalake ecosystem.
Integration of External Environmental Data (Junta de Andalucía)	Integration of datasets provided by the Andalusian Regional Government into the LifeWatch datalake. These datasets enhance the completeness and regional relevance of environmental monitoring services.
Helgoland Viewer for SOS	Lightweight web application for exploring, visualising, and comparing time-series data from environmental sensors via the SOS service. It enables researchers to interactively explore real-time and historical observations in a user-friendly interface.
LifeWatch Real-Time Sensor Dashboard (ArcGIS)	Interactive dashboard for real-time visualisation of environmental data from the Sierra Nevada sensor National Park network prototype. It supports monitoring, analysis, and early detection of anomalies.
LifeWatch CKAN Data Catalogue	Platform for publishing, discovering, and accessing structured environmental datasets. It facilitates reuse of curated data from the datalake, enabling download in open formats and integration via APIs. It complements GeoNetwork with a dataset-oriented approach.

URL	Reference to documentation (training, technical, etc)	New product/ upgrade
Access restricted	Internal technical documentation available for service administration and development purposes	New product
Access restricted	Technical documentation under development	New product
Access	Technical documentation under development	New product
Access Access restricted	Technical documentation under development	New product
Access Access restricted	Internal technical documentation available for service administration and development purposes	New product

LifeWatch ERIC
as a community

LifeWatch ERIC continuously works to strengthen its ties and foster the engagement of relevant scientific communities and individual researchers, developers, stakeholders and citizen scientists through a co-design and co-development process.

Pan-European relevance

Advancing Integration, Policy Alignment, and Global Commitments

In 2024, **LifeWatch ERIC reaffirmed its strategic role** within the European Research and Innovation ecosystem by actively facilitating **multidisciplinary** and **cross-domain collaboration** and fostering **knowledge integration**. A central achievement has been the advancement of "**collaborative interfaces**" or "**trading zones**" within the **European Open Science Cloud (EOSC)**, shared platforms that enable scientists from diverse fields to seamlessly exchange data, analytical tools, and research outputs.

These efforts have strengthened LifeWatch ERIC's position as a **key actor in the design and implementation of the next generation of EOSC initiatives**, ensuring full alignment with the European Union's open science and innovation agendas.

In parallel, LifeWatch ERIC has taken concrete steps to **consolidate the European Research Infrastructure (RI) landscape**, through the following high-impact actions:

- **Building a Strategic Biodiversity Research Coalition**
  LifeWatch ERIC led the formation of a pan-European network of **Research Infrastructures, e-Infrastructures, Scientific Publishers, and major EU-funded projects** focused on biodiversity and ecosystem research. This coalition coordinated efforts to support the **Kunming-Montreal Global Biodiversity Framework**, and convened a **high-level workshop at the UN General Assembly Science Summit (New York, September 2024)**. The session showcased collaborative mechanisms that align with the Framework's goals and emphasised the **inclusion of Indigenous Peoples** in biodiversity science and policy.
- **Supporting the One Health Agenda**
  By the end of 2024, this network was further expanded to include leading organisations working on the **life dimension of the biosphere**, with the objective of supporting the **implementation of the UN One Health framework**, a critical science-policy interface between biodiversity, human and animal health.
- **Operationalising the Biodiversity Knowledge Hub**
  LifeWatch ERIC completed its **federated data and information platform**, powered by **blockchain technology**, to ensure secure, transparent, and traceable access to biodiversity and ecosystem data. This is now fully operational through the **Biodiversity Knowledge Hub**, which interlinks European repositories and global aggregators, facilitating evidence-based policy implementation and research needs of the community.
- **Enhancing the Science Knowledge Graph (SKG)**
  The **upgraded SKG** now supports the **integration of LifeWatch ERIC's internal datasets and services**, as well as **federates resources** from other ERICs, RIs, and global platforms, thus strengthening the EU's capacity to synthesise and mobilise scientific knowledge for policy use.
- **Driving Synergies Across Horizon Europe Projects**
  LifeWatch ERIC continued its **active participation in EU-funded projects and consortia** under Horizon Europe, including **EOSC Beyond, OSCARS, OSTrails, and ENVRI-Hub NEXT**, delivering interoperable solutions and cross-infrastructure services that are critical for coordinated environmental and climate action.
- **Expanding Strategic Dialogue**
  The infrastructure has further strengthened its partnerships with **other ERICs, research infrastructures, aggregators, and knowledge networks**, to **co-design and co-develop shared services and standards**, maximising the use and impact of existing European and international resources.
- **Bridging National and European Ambitions**
  Through coordinated activities and shared deliverables outlined in its **Strategic Working Plan (SWP)**, LifeWatch ERIC has contributed to the **alignment of national investments and efforts** with European research priorities. These achievements were made possible through a **blended model of in-cash and in-kind** contributions from member states, demonstrating the value of collective investment in European-scale solutions.

Institutional relationships

In 2024, LifeWatch ERIC made significant efforts to achieve its objectives and engage more institutions and governments in its vision of biodiversity and e-science.

New **memoranda of understanding (MoUs)** were signed with the University of Seville and the University Pablo de Olavide (UPO). Meetings were held with the Argentinian Institute IMiBio Misiones, the Uruguayan International Cooperation Agency, and representatives from several countries: Ireland, Poland, Lithuania, Latvia, Estonia, Switzerland, and Romania. Various collaboration and engagement opportunities were discussed.

A notable achievement in 2024 was LifeWatch ERIC's formal accreditation as a **Knowledge Agent by the Junta de Andalucía**. This milestone officially recognises LifeWatch ERIC's role in advancing research, technological development, and innovative projects that benefit the scientific community and society at large.

Big Seashell Survey. Photo by Annelies Tavernier

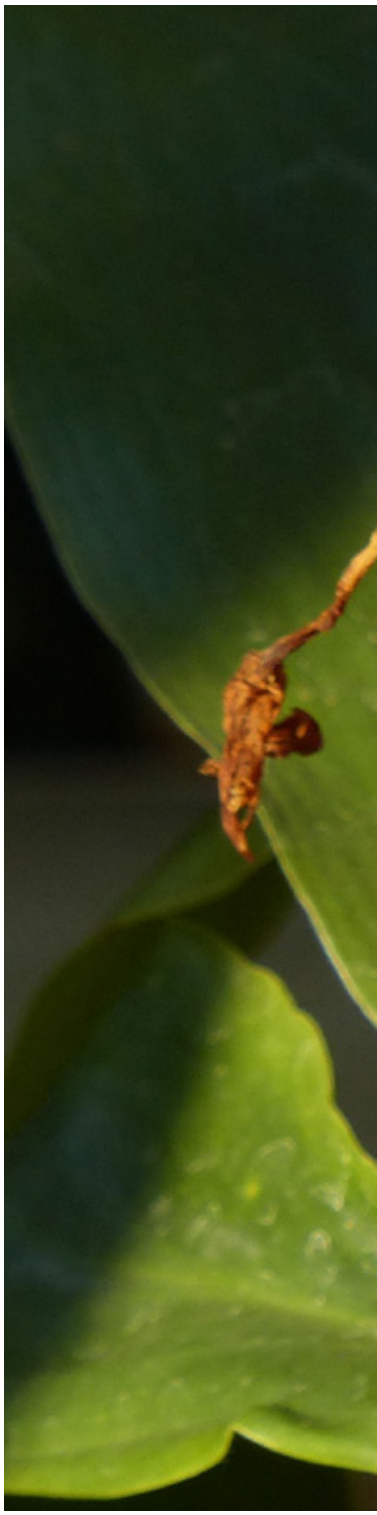
Scientific networking

Throughout 2024, the Scientific Networking Team promoted **interdisciplinary collaboration and improved interoperability** across biodiversity research infrastructures, **reinforcing synergies** among **Distributed Centres** and **international stakeholders** in support of LifeWatch ERIC's vision and mission. These activities were shaped by implementation of LifeWatch ERIC Strategy for Users and Stakeholders, approved by LifeWatch ERIC General Assembly in November 2024. The Strategy defines key user categories (from researchers and policymakers to NGOs and the private sector) and supports co-designed, inclusive approaches. Central to this is the continuous mapping of user needs, guiding the development of tailored services and research environments.

Within this framework, six **Thematic Services Working Groups** (TSWGs), were established, based on the key priority areas of LifeWatch ERIC SWP: Taxonomy , Biogeography, Climate Change, Animal Movement, Habitat Mapping and Observatory Automation. Co-developed with scientists from both the National Distributed Centres and the Common Facilities, these Working Groups are now active within LifeWatch ERIC's virtual community workspace and are expected to deliver e-Services, vLabs and VREs. Their activities began with a series of workshops held in Belgium, Italy, Portugal, and Slovenia, involving over 326 participants. The following section of this Annual Report provides further details on the scope, objectives, lines of activity and contact points of each of them.

Engagement of the relevant scientific communities was also strengthened through **participation in major international conferences**, supported by the LifeWatch ERIC Communication Team in the organisation of each institutional booth. This included the MBON Workshop on Marine Biodiversity Observations, the Tropical Ecology Summit, and the British Ecological Society (BES) Conference.

At the BES Conference, more than **300 researchers** across **33 countries** (**48% early career researchers**), visited the LifeWatch ERIC booth and took part in a dedicated survey. A total of **275 responses** were collected, providing valuable insights into community needs and expectations. The results confirmed the alignment with LifeWatch ERIC's strategic priorities and revealed particularly strong interest in Working Group activities, especially those on Climate Change, Biogeography, and Animal Movement.



Top 5 Publications

- Perez Perez, R., Vandepitte, L., Radermecker, C., Delgat, L., Beja, J., Yperman, H., Dumon, D., Vanhoorne, B., & Tyberghein, L. (2024). *The European Ocean Biodiversity Information System (EurOBIS) Celebrates Its 20th Anniversary: Where Did It Start, and What Have We Learned?* Biodiversity Information Science and Standards 8. **https://doi.org/10.3897/biss.8.135473**

- Lasa, A.V., Fernández-González, A.J., Villadas, P.J., Mercado-Blanco, J., Pérez-Luque, A.J., & Fernández-López, M. (2024). *Mediterranean pine forest decline: A matter of root-associated microbiota and climate change.* Science of the Total Environment 926. 171858. **https://doi.org/10.1016/j.scitotenv.2024.171858**

- Oestreich, W.K., Oliver, R.Y., Chapman, M.S., Go, M., & McKenna, M.F. (2024). *Listening to animal behavior to understand changing ecosystems.* Trends in Ecology & Evolution 39. **https://doi.org/10.1016/j.tree.2024.06.007**

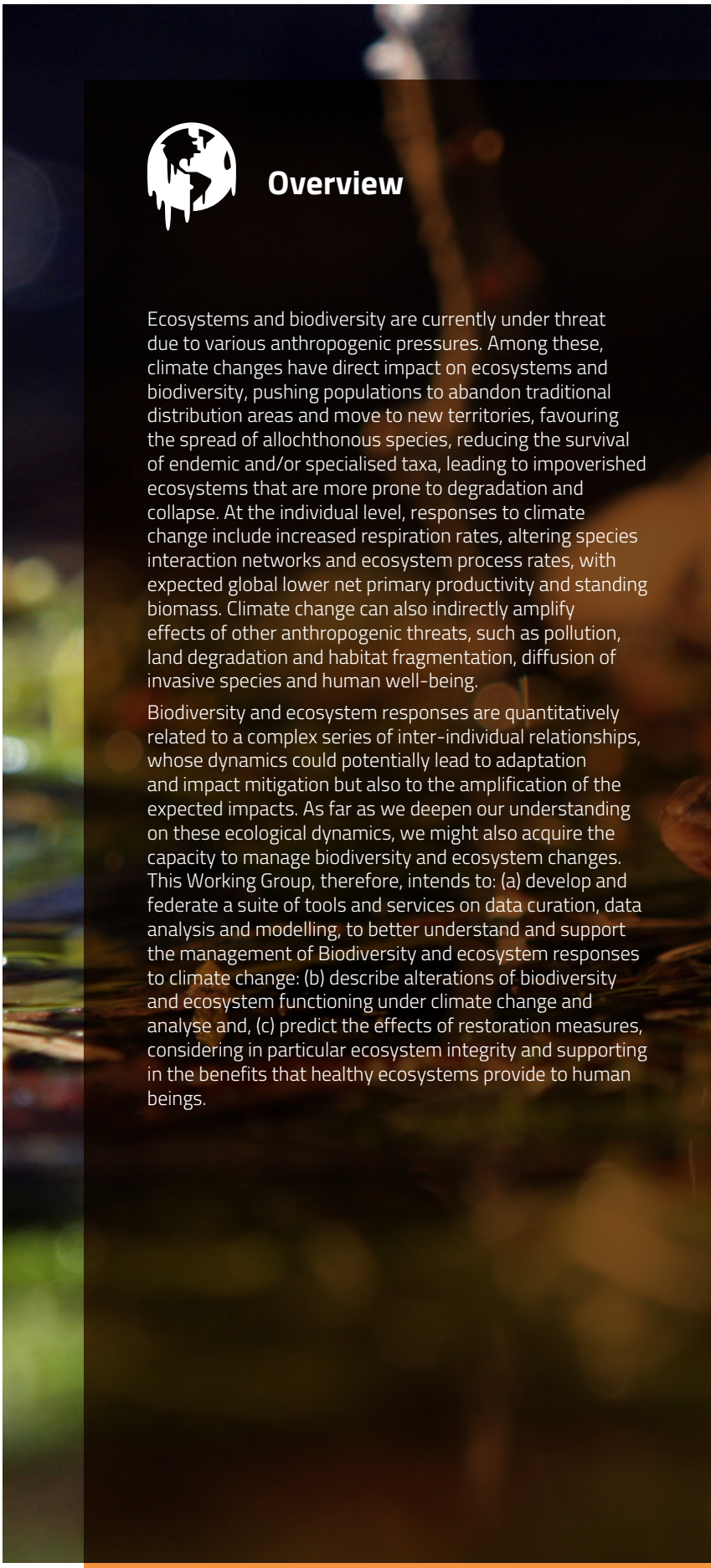
- Calonge, A., Goossens, J., Muñiz, C., Reubens, J., & Debusschere, E. (2024). *Importance of multi-sensor observations to advance species co-occurrence knowledge: a demonstration of two acoustic technologies.* Marine Ecology Progress Series 727. **https://doi.org/10.3354/meps14496**

- Song, Y., Xin, R., Chen, P., Zhang, R., Chen, J., & Zhao, Z. (2024). *Autonomous selection of the fault classification models for diagnosing microservice applications.* Journal of Systems and Software 206. 111711. **https://doi.org/10.1016/j.jss.2023.111711**

The Orange Ginger Lily (*Hedychium coccineum Buch*).
Picture taken in Padua, at the Botanical Garden, Italy.
Photo by Andrea Moro (License: https://creativecommons.org/licenses/by-sa/4.0/),
original: https://dryades.units.it/dryades/plants/foto/TS173972.jpg

The Thematic Services Working Groups

Biodiversity and Ecosystem Responses to Climate Change



Overview

Ecosystems and biodiversity are currently under threat due to various anthropogenic pressures. Among these, climate changes have direct impact on ecosystems and biodiversity, pushing populations to abandon traditional distribution areas and move to new territories, favouring the spread of allochthonous species, reducing the survival of endemic and/or specialised taxa, leading to impoverished ecosystems that are more prone to degradation and collapse. At the individual level, responses to climate change include increased respiration rates, altering species interaction networks and ecosystem process rates, with expected global lower net primary productivity and standing biomass. Climate change can also indirectly amplify effects of other anthropogenic threats, such as pollution, land degradation and habitat fragmentation, diffusion of invasive species and human well-being.

Biodiversity and ecosystem responses are quantitatively related to a complex series of inter-individual relationships, whose dynamics could potentially lead to adaptation and impact mitigation but also to the amplification of the expected impacts. As far as we deepen our understanding on these ecological dynamics, we might also acquire the capacity to manage biodiversity and ecosystem changes. This Working Group, therefore, intends to: (a) develop and federate a suite of tools and services on data curation, data analysis and modelling, to better understand and support the management of Biodiversity and ecosystem responses to climate change: (b) describe alterations of biodiversity and ecosystem functioning under climate change and analyse and, (c) predict the effects of restoration measures, considering in particular ecosystem integrity and supporting in the benefits that healthy ecosystems provide to human beings.

Coordinators: **Alberto Basset**, **Antonello Provenzale**

Lines of activities

Mapping requirements

- Mapping services to address the "Biodiversity & Ecosystem Responses to Climate Change" already available in LifeWatch ERIC and ensure their accessibility from the LifeWatch ERIC 'marketplace'.
- Mapping needs and requirements to boost research activities within the membership of the Working Group, setting priorities for the enlarging the inventory and filling in the gaps.

Implementing services

- Developing a catalogue of commonly used models and/or particularly relevant to address key "Biodiversity & Ecosystem Responses to Climate Change".
- Integrating the models into web-services and uploading their metadata on the LifeWatch ERIC 'marketplace'.

Organising Working Group workshops and conferences

- Organisation of the Working Group participation to the BEeS 2025 Conference on "Addressing the Triple Planetary Crisis" which will be held in Crete from 30 June to 3 July 2025.
- Organisation of the Working Group Workshop *'Ecological modelling and eco-informatics to address functional responses of biodiversity and ecosystems to climate change'* co-organised with the University of Salento.

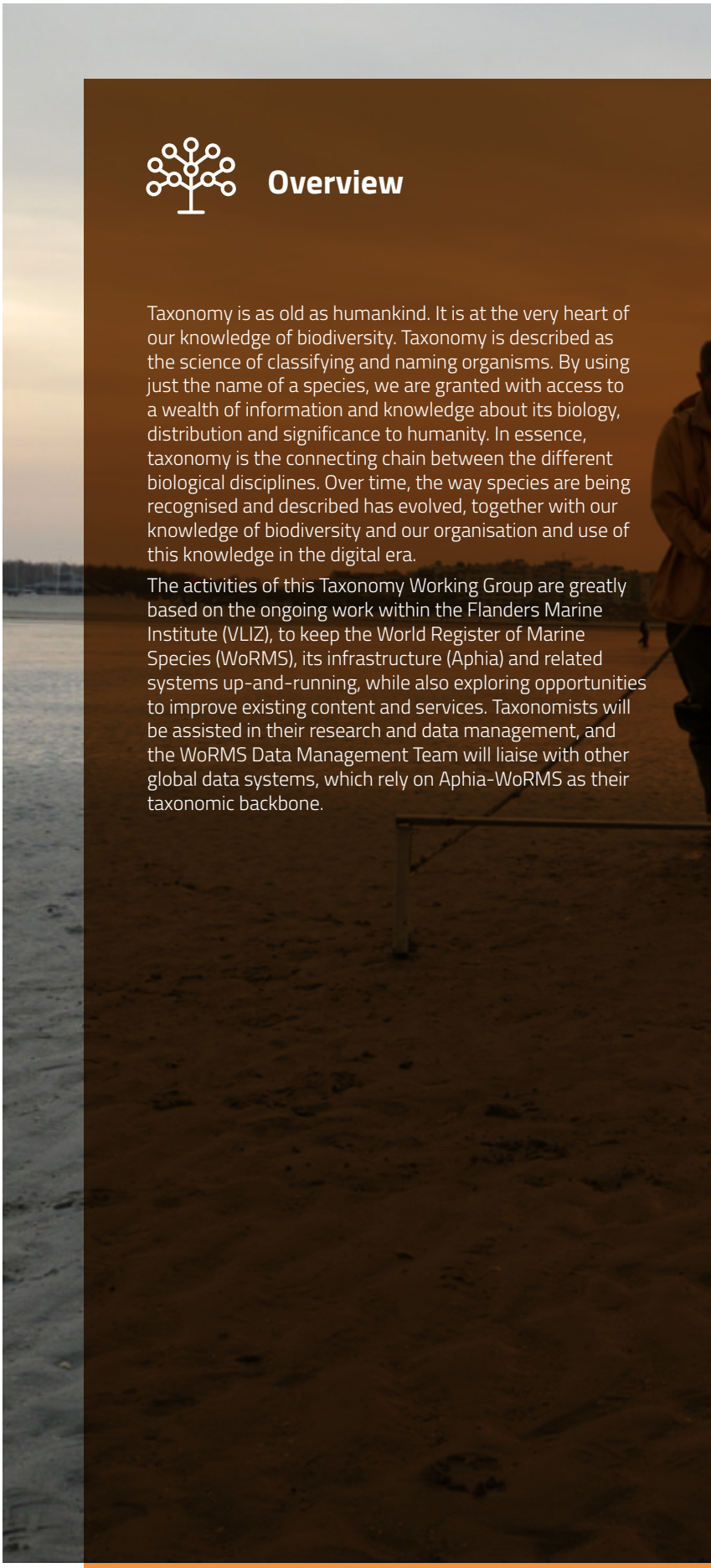
Fund raising

- Mapping opportunities for project application of a Working Group consortium to Horizon Europe calls 2026-2027 and to other calls of national/ international relevance.

The Moor Frog (*Rana arvalis*). Picture taken in a marshy area on the outskirts of Ljubljana, the capital of Slovenia. Photo by Tomi Trilar, Slovenian Museum of Natural History (LifeWatch Slovenia).

The Thematic Services Working Groups

Taxonomy



Overview

Taxonomy is as old as humankind. It is at the very heart of our knowledge of biodiversity. Taxonomy is described as the science of classifying and naming organisms. By using just the name of a species, we are granted with access to a wealth of information and knowledge about its biology, distribution and significance to humanity. In essence, taxonomy is the connecting chain between the different biological disciplines. Over time, the way species are being recognised and described has evolved, together with our knowledge of biodiversity and our organisation and use of this knowledge in the digital era.

The activities of this Taxonomy Working Group are greatly based on the ongoing work within the Flanders Marine Institute (VLIZ), to keep the World Register of Marine Species (WoRMS), its infrastructure (Aphia) and related systems up-and-running, while also exploring opportunities to improve existing content and services. Taxonomists will be assisted in their research and data management, and the WoRMS Data Management Team will liaise with other global data systems, which rely on Aphia-WoRMS as their taxonomic backbone.

Coordinator: **Leen Vandepitte**

Lines of activities

Mapping and improving current status

- Discussing the current state of the Taxonomy Services, how they match with the scientific community needs and requirements and identify approaches and priorities to further improve these services, as well as user engagement.

Participating in taxonomy-related workshops and conferences

- As part of ongoing Aphia-WoRMS activities, the Data Management Team supports editor-meetings by either facilitation or participation. When opportunities arise, the Aphia-WoRMS work is presented at meetings and conferences, both as a Data Management Team activity and in collaboration with taxonomic experts.

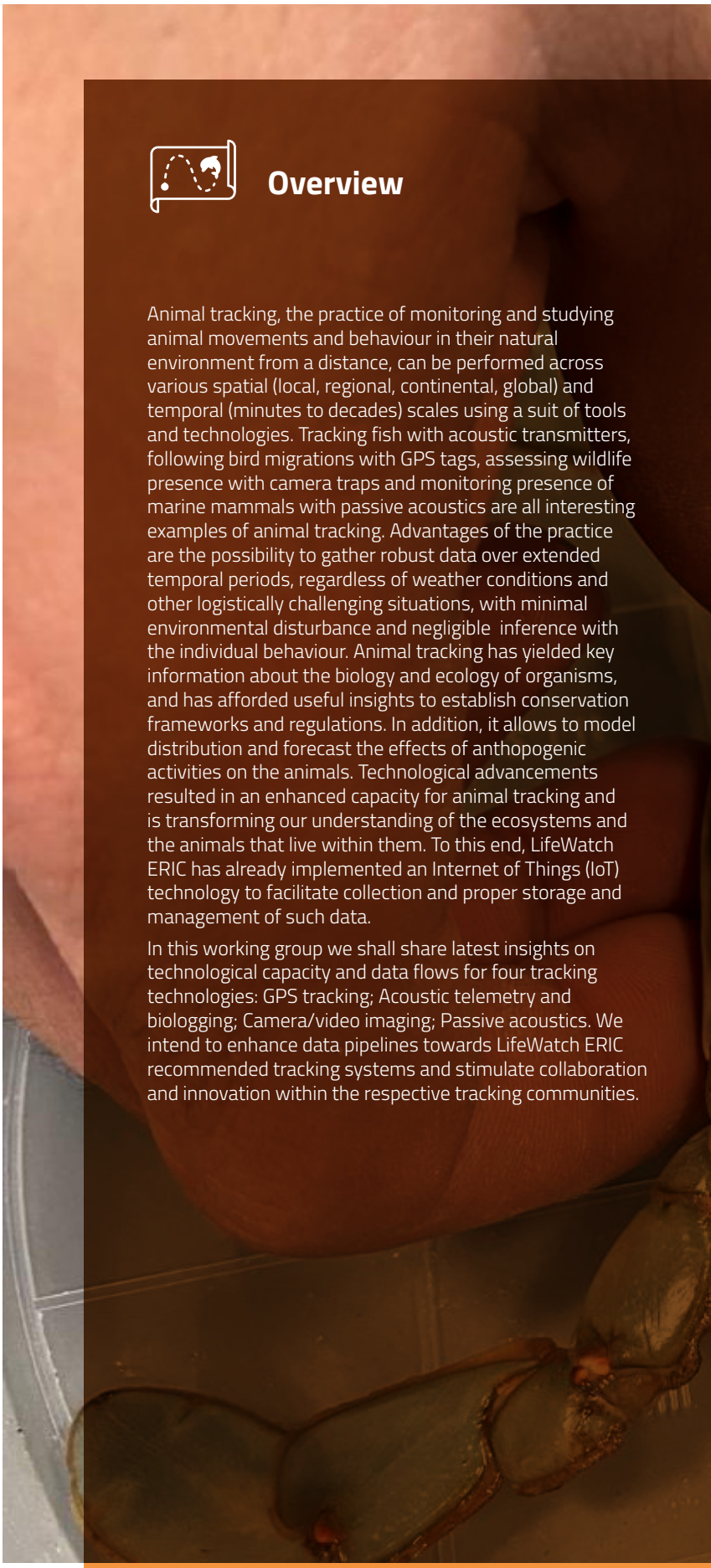
Fund raising

- Mapping opportunities for project application for Aphia-WoRMS to Horizon Europe calls and to other calls of national/international relevance.

Big Seashell Survey. Photo by Annelies Tavernier

The Thematic Services Working Groups

Animal movement, Behaviour and Biologging



Overview

Animal tracking, the practice of monitoring and studying animal movements and behaviour in their natural environment from a distance, can be performed across various spatial (local, regional, continental, global) and temporal (minutes to decades) scales using a suit of tools and technologies. Tracking fish with acoustic transmitters, following bird migrations with GPS tags, assessing wildlife presence with camera traps and monitoring presence of marine mammals with passive acoustics are all interesting examples of animal tracking. Advantages of the practice are the possibility to gather robust data over extended temporal periods, regardless of weather conditions and other logistically challenging situations, with minimal environmental disturbance and negligible inference with the individual behaviour. Animal tracking has yielded key information about the biology and ecology of organisms, and has afforded useful insights to establish conservation frameworks and regulations. In addition, it allows to model distribution and forecast the effects of anthopogenic activities on the animals. Technological advancements resulted in an enhanced capacity for animal tracking and is transforming our understanding of the ecosystems and the animals that live within them. To this end, LifeWatch ERIC has already implemented an Internet of Things (IoT) technology to facilitate collection and proper storage and management of such data.

In this working group we shall share latest insights on technological capacity and data flows for four tracking technologies: GPS tracking; Acoustic telemetry and biologging; Camera/video imaging; Passive acoustics. We intend to enhance data pipelines towards LifeWatch ERIC recommended tracking systems and stimulate collaboration and innovation within the respective tracking communities.

Coordinator: **Jan Reubens**

Lines of activities

Enhance established data pipelines towards LifeWatch ERIC recommended systems

- Dataflow blueprint: enabling a sustainable dataflow of tracking data towards LifeWatch ERIC recommended IoT systems for the four focus technologies of this Working Group.
- Writing a dissemination report on the Dataflow.

Stimulate collaboration, dissemination and innovation within the respective tracking communities

- Mapping the scientific user community of the respective tracking communities.
- Organising webinars for knowledge dissemination.

Fund raising

- Organisation of the Working Group participation in the BEeS 2025 Conference on "Addressing the Triple Planetary Crisis" which will be held in Crete from 30 June to 3 July 2025.
- Participate in the Workshop *'Ecological modelling and eco-informatics to address functional responses of biodiversity and ecosystems to climate change'* co-organised by the relevant Working Group and the University of Salento.

The Atlantic Blue Crab (*Callinectes sapidus*). Picture taken at the Bio4IU laboratory, University of Salento. Photo by Vanessa Marrocco (LifeWatch ERIC).

The Thematic Services Working Groups

Biogeography

Overview

Biogeography explores the spatial and temporal distribution of life on Earth, revealing the complex vectors that shape biodiversity patterns across regions and ecosystems. Environmental changes, both natural and anthropogenic, continuously reshape species distributions, leading to shifts in community composition, habitat fragmentation, and alter ecosystem structure and functioning. Climate change, habitat loss, and biological invasions are among the key drivers of these shifts, threatening endemic species and facilitating the expansion of generalist and invasive organisms.

The study of biogeographical patterns is essential for understanding species dispersal mechanisms, historical contingencies, and ecological interactions. Rapid environmental changes are accelerating range shifts, local extinctions, and novel species assemblages, making predictive models and conservation planning more critical than ever. Integrating paleobiogeography, phylogenetics, and ecological niche modelling allows for a deeper comprehension of biodiversity dynamics and the resilience of ecosystems to ongoing pressures.

In this Working Group, we aim to develop and implement innovative tools for biogeographical data analysis, modelling, and visualisation. Our objective is to investigate biodiversity distribution patterns, assess the impacts of global change on species ranges, and predict future biogeographical trends. By applying interdisciplinary approaches, we seek to enhance conservation strategies and foster a deeper understanding of the mechanisms driving the spatial organisation of life on Earth.

Coordinator: **Alessandro Chiarucci**

Lines of activities

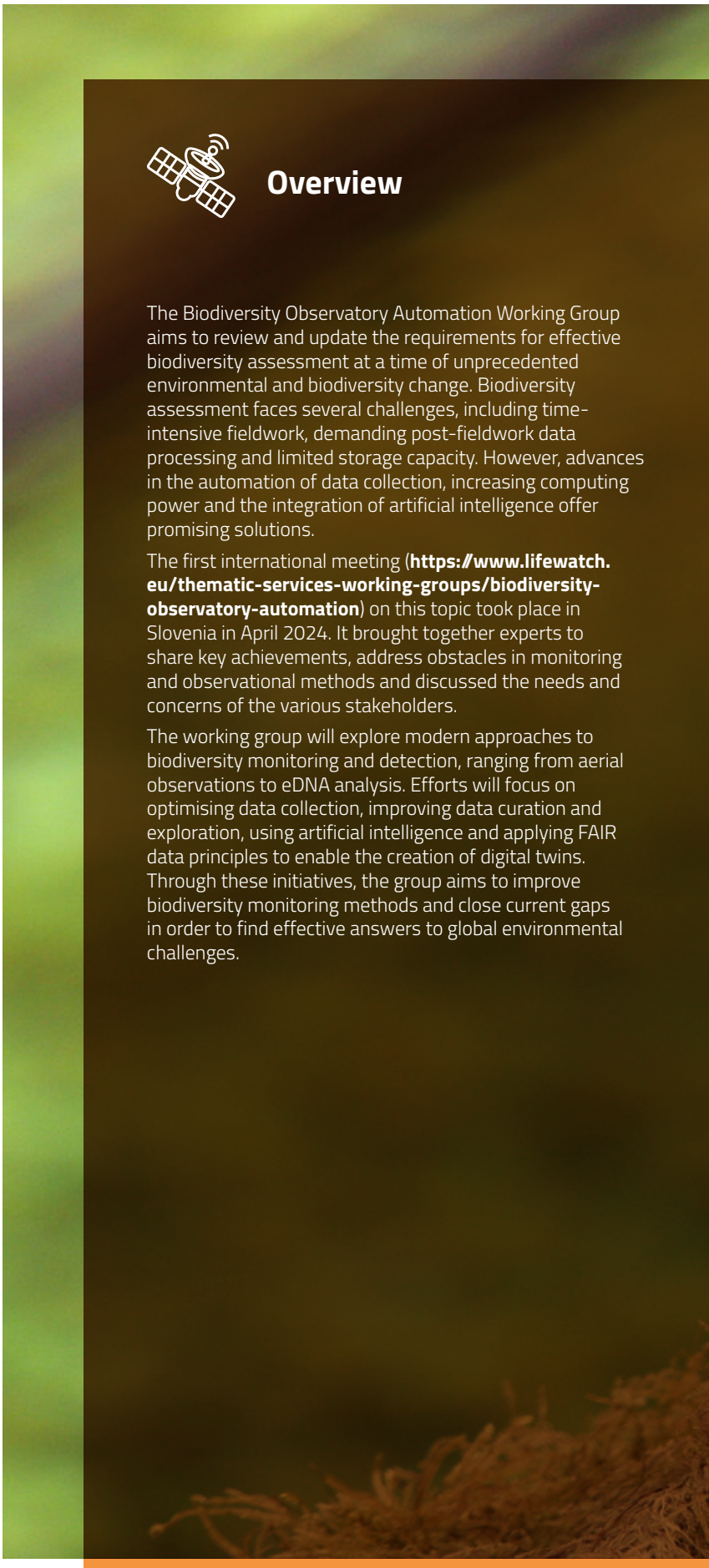
Enhance the analytical capacity of LifeWatch ERIC in the study of Biogeography

- Mapping services to address the "Biogeography" already available in LifeWatch ERIC and ensure their accessibility from the LifeWatch ERIC 'marketplace'.
- Mapping needs and requirements to boost research activities within the membership of the Working Group, setting priorities for enlarging the inventory and filling in the gaps.

The European Mudminnow (*Umbra krameri*). Picture taken in captivity, while the individual was collected in the oxbow lake Nagy Parlag near the village of Petišovci in north-east Slovenia. Photo by Tomi Trilar, Slovenian Museum of Natural History (LifeWatch Slovenia).

The Thematic Services Working Groups

Biodiversity Observatory Automation



Overview

The Biodiversity Observatory Automation Working Group aims to review and update the requirements for effective biodiversity assessment at a time of unprecedented environmental and biodiversity change. Biodiversity assessment faces several challenges, including time-intensive fieldwork, demanding post-fieldwork data processing and limited storage capacity. However, advances in the automation of data collection, increasing computing power and the integration of artificial intelligence offer promising solutions.

The first international meeting (**https://www.lifewatch.eu/thematic-services-working-groups/biodiversity-observatory-automation**) on this topic took place in Slovenia in April 2024. It brought together experts to share key achievements, address obstacles in monitoring and observational methods and discussed the needs and concerns of the various stakeholders.

The working group will explore modern approaches to biodiversity monitoring and detection, ranging from aerial observations to eDNA analysis. Efforts will focus on optimising data collection, improving data curation and exploration, using artificial intelligence and applying FAIR data principles to enable the creation of digital twins. Through these initiatives, the group aims to improve biodiversity monitoring methods and close current gaps in order to find effective answers to global environmental challenges.

Coordinator: **Andreja Ramšak**

Lines of activities

Explore Biodiversity Monitoring Methods

- Identify and integrate cutting-edge technologies, such as machine learning, remote sensing, and eDNA analysis, to improve biodiversity assessment.
- Reduce reliance on labor-intensive fieldwork by promoting automation.

Optimise Data Collection and Processing

- Develop efficient and scalable methods for biodiversity data collection and curation.
- Improve data storage, accessibility, and interoperability to support global research efforts.

Advance AI and Computational Tools for Biodiversity Assessment

- Leverage machine learning and computational models for species identification, habitat mapping, and ecological trend analysis.
- Automate data interpretation to enhance monitoring accuracy and efficiency.

Promote FAIR Data Principles

- Ensure that biodiversity data is Findable, Accessible, Interoperable, and Reusable (FAIR).
- Develop standardised data-sharing protocols for improved interoperability and collaboration.

Foster International Collaboration and Knowledge Exchange

- Strengthen global partnerships by organising conferences, workshops, and networking events.
- Share best practices and insights to create a unified approach to automated biodiversity assessment.

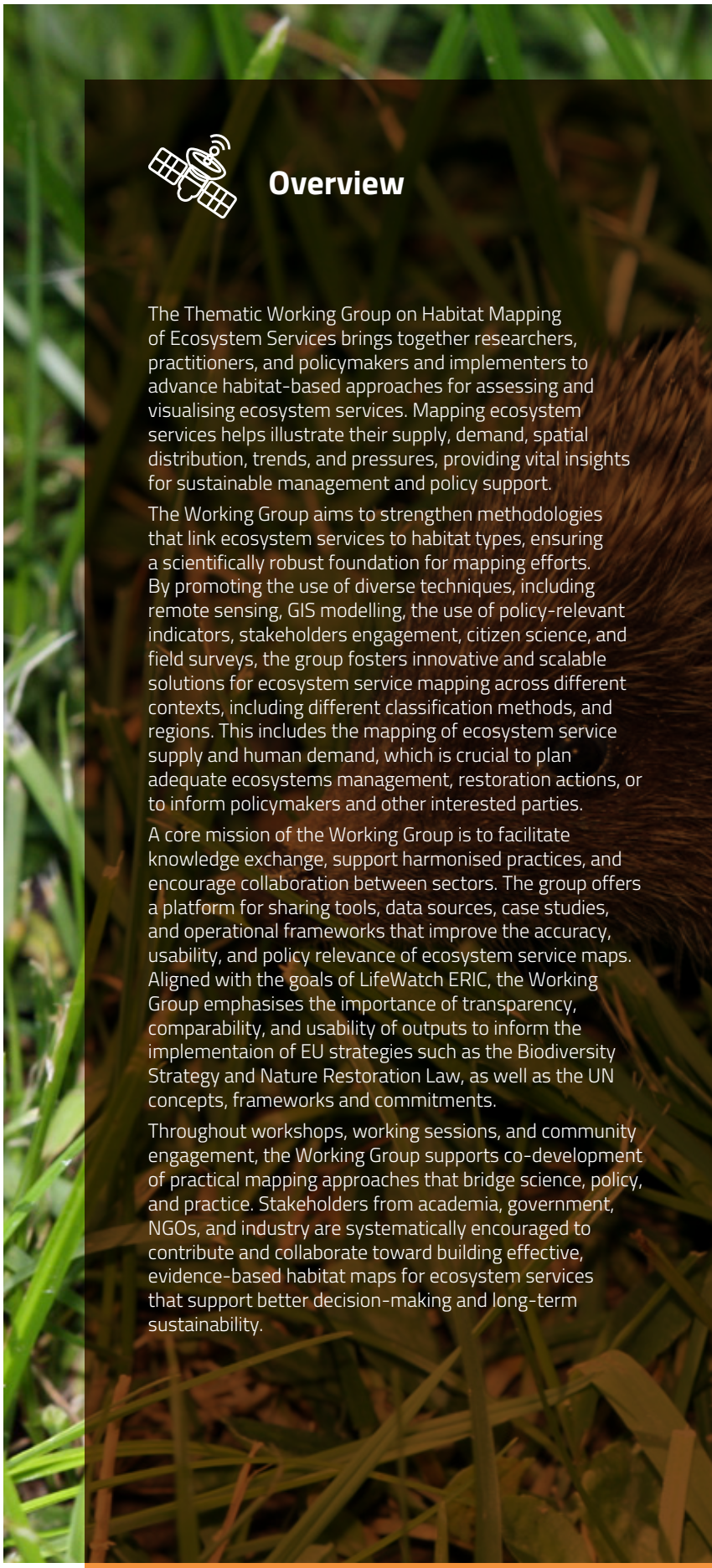
Develop and Apply VREs Technology

- Create virtual models of ecosystems to simulate environmental changes and predict biodiversity responses.
- Use simulation scenarios for planning and impact assessments in conservation efforts.

The White-throated Dipper (*Cinclus cinclus*). Picture taken in March in Ukanc on the Savica stream, the largest of the streams that flow into Bohinj Lake in north-west Slovenia. Photo by Tomi Trilar, Slovenian Museum of Natural History (LifeWatch Slovenia).

The Thematic Services Working Groups

Habitat Mapping



Overview

The Thematic Working Group on Habitat Mapping of Ecosystem Services brings together researchers, practitioners, and policymakers and implementers to advance habitat-based approaches for assessing and visualising ecosystem services. Mapping ecosystem services helps illustrate their supply, demand, spatial distribution, trends, and pressures, providing vital insights for sustainable management and policy support.

The Working Group aims to strengthen methodologies that link ecosystem services to habitat types, ensuring a scientifically robust foundation for mapping efforts. By promoting the use of diverse techniques, including remote sensing, GIS modelling, the use of policy-relevant indicators, stakeholders engagement, citizen science, and field surveys, the group fosters innovative and scalable solutions for ecosystem service mapping across different contexts, including different classification methods, and regions. This includes the mapping of ecosystem service supply and human demand, which is crucial to plan adequate ecosystems management, restoration actions, or to inform policymakers and other interested parties.

A core mission of the Working Group is to facilitate knowledge exchange, support harmonised practices, and encourage collaboration between sectors. The group offers a platform for sharing tools, data sources, case studies, and operational frameworks that improve the accuracy, usability, and policy relevance of ecosystem service maps. Aligned with the goals of LifeWatch ERIC, the Working Group emphasises the importance of transparency, comparability, and usability of outputs to inform the implementaion of EU strategies such as the Biodiversity Strategy and Nature Restoration Law, as well as the UN concepts, frameworks and commitments.

Throughout workshops, working sessions, and community engagement, the Working Group supports co-development of practical mapping approaches that bridge science, policy, and practice. Stakeholders from academia, government, NGOs, and industry are systematically encouraged to contribute and collaborate toward building effective, evidence-based habitat maps for ecosystem services that support better decision-making and long-term sustainability.

Coordinator: **Ana Lillebø**
Co-coordinators: **Olga Ameixa, Heliana Texeira**

Lines of activities

Mapping Requirements and Gap Analysis

- Identify supply and demand for ecosystem services most relevant for targeted actions (e.g., biodiversity conservation, restoration planning, climate change response), and assess current mapping coverage within LifeWatch ERIC.
- Ensure mapped services and associated data are accessible via the LifeWatch ERIC Marketplace.
- Collect mapping needs from Working Group members and stakeholders to guide the expansion of datasets and prioritise efforts to fill spatial and thematic gaps.

Methodological Alignment and Innovation

- Promote harmonisation of methodologies by reviewing and aligning mapping standards, classification systems, and indicators across members.
- Encourage the integration of advanced techniques such as remote sensing, GIS modelling, and machine learning for scalable, habitat-based ecosystem service mapping.
- Support methodological innovation through joint development and testing of mapping approaches, especially linking ecosystem service supply and demand.

Knowledge Exchange and Capacity Building

- Organise workshops, webinars, and training sessions at regular intervals to exchange know-how, share case studies, and build technical skills among members.
- Create a shared repository of guidance documents, tools, templates, and data resources accessible to Working Group members and broader communities.
- Facilitate cross-sector learning and foster interdisciplinary collaboration among ecologists, data scientists, spatial planners, and policymakers.

Policy Relevance and Uptake

- Develop policy-relevant use cases demonstrating the application of habitat-based mapping in supporting EU strategies (e.g. Biodiversity Strategy, Nature Restoration Law).
- Engage with policymakers and practitioners to co-design outputs that are directly usable in planning, reporting, and restoration initiatives.
- Promote the Working Group's work as a model for ecosystem-based planning, reinforcing LifeWatch ERIC's role in supporting science-policy interfaces.

The Northern White-breasted Hedgehog (*Erinaceus roumanicus*). Picture taken in summer in the vineyards of Drankovec in Slovenske gorice in north-eastern Slovenia. Photo by Tomi Trilar, Slovenian Museum of Natural History (LifeWatch Slovenia).

Communication

During 2024 the well-oiled activities of LifeWatch ERIC communication team ensured the **coordination and support** to the **Common Facilities and National Distributed Centres** activities. Pivotal in this sense is the support given to the Thematic Services Working Groups initiative.

The main efforts focused on initiatives undertaken by LifeWatch ERIC to connect with its user base and stakeholders. If in the previous year, most of the engagement was obtained through the organisation of the BEeS conference in Seville, in 2024, a different approach was adopted, aiming to **establish direct connections with specific scientific communities**, in tight coordination with the Scientific Community Networking team.

It is worth mentioning the following targeted groups: conservation biologists, ICT and technical experts, scientists specialising in all topics of biodiversity and ecosystems research, and institutional stakeholders. Thanks to booths organised by representatives of these communities, more than **550 scientists** and **potential users** of LifeWatch ERIC tools and services were engaged over the course of four meetings. Throughout the year, we engaged over **1,100 researchers**, including those at events organised by LifeWatch ERIC. The year ended with the announcement of the **2025 BEeS Conference** in **Crete** from **30 June to 3 July 2025.**

Over the past year, LifeWatch ERIC has made significant contributions to Horizon Europe projects. In particular, in the projects **ENVRI-Hub Next, Marine SABRES, MARBEFES and RESTORE4Cs**, it played a key role as either task or Work Package leader, reflecting its positioning as reference point in communications. In this regard, it is worth mentioning the release of video teasers for the Marine SABRES and RESTORE4Cs documentaries (available on the **LifeWatching TV**): an innovative storytelling approach in this context. These were designed and implemented in synergy with LifeWatch Italy.

In terms of web performance, we witnessed an **18% growth of our follower base** on social media, mainly driven by LinkedIn and despite the progressive withdrawal from X by many users, which has consistently marked the year. To address this shift, a new account was opened on BlueSky to evaluate the potential of this emerging social network. The successful engagement obtained through events reflected on the newsletter performance, with a **44% increase** in its **subscribers** and an impressive **open rate of 37%** (compared to a general average of 20%). Website data for the current year show stabilisation of LifeWatch ERIC traffic[1].

1 The implementation of cookie rejection/acceptance features on all LifeWatch ERIC web platforms (as prescribed by Privacy Policy indications) is estimated to have affected web traffic tracking in Europe by approximately 40%. Therefore, data should be interpreted with this consideration in mind.

Big Seashell Survey. Photo by Annelies Tavernier (LifeWatch Belgium).

Training

In 2024 LifeWatch ERIC, concluding a process initiated in 2023, finalised and released its **first training strategy**. Adopted by the General Assembly, the document marks a very important step in the infrastructure's training action, as it defines the overall approach of the infrastructure to its training and learning initiatives and activities. More specifically, the Training Strategy holds that LifeWatch ERIC assumes two distinct, but strictly interrelated roles: on the one hand, it acts as **training provider**, developing and delivering to the biodiversity and ecosystems research communities learning and training contents and products, while on the other, it also acts as **training hub**, maintaining and offering its online training infrastructure and tools to institutions, projects and stakeholders, hosting their resources and materials.

The year 2024 was particularly productive with respect to this second role, with the infrastructure launching project sections for **DOORS, BioDT, SUBMERSE** and **BiKICL**, populating them with a total 24 resources.

Simultaneously, discussions aimed at offering a similar service to other four projects were also initiated and are expected to bring results in 2025.

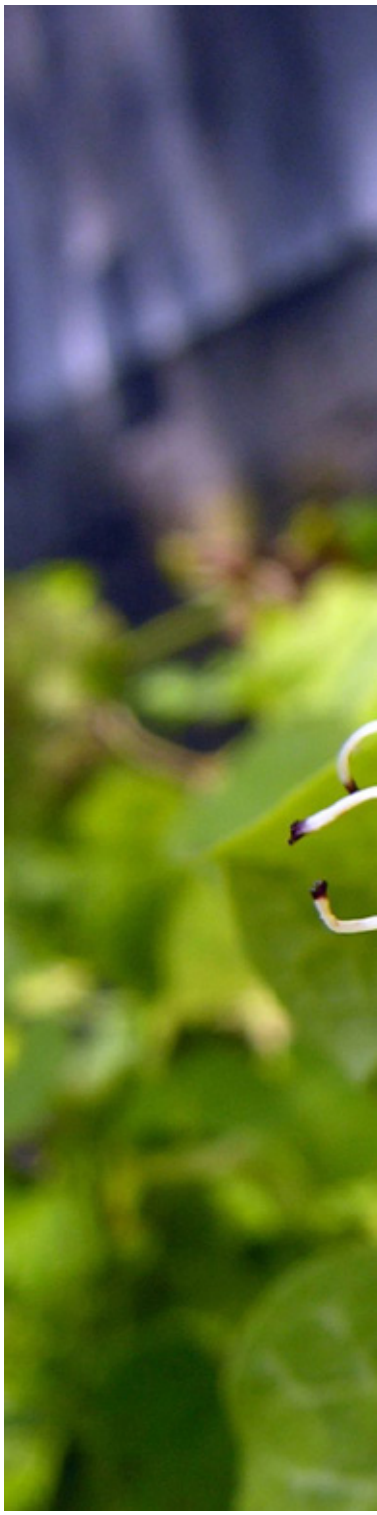
On the other hand, as **training provider,** LifeWatch ERIC delivered, or contributed to virtual initiatives such as **project-related training, webinars and workshops** and launched a **serious game** about Ocean Literacy for the first Marine SABRES project international school competition, engaging 10 classes of 7 primary and secondary schools based in Italy, Greece and Spain.

LifeWatch ERIC also initiated a new and extremely promising line of work with the conceptualisation of a new type of training material, the **scientific talks**. Launched in the midst of the BioDT project, and aimed at raising awareness and scientific curiosity while also disseminating knowledge on biodiversity digital twins, the first ever series of talks started production in 2024 and will be publicly available next year.

In the same year, LifeWatch ERIC, in an effort aimed at enhancing the quality of its work and outputs, devised a plan for **capacity development sessions** for its internal staff. The plan, developed by the Human Resources and the training team, with the support of the communication one, includes capacity building activities on presentation skills, video presentation skills, leadership skills and training skills.

In 2024, LifeWatch ERIC continued to promote the discussions concerning the internationalisation of the **Master programme on e-Biodiversity and Ecosystem Sciences (eBES)** brokering an agreement for the organisation of a Joint Master's Degree between the University of Salento (LifeWatch Italy) and the Agricultural University of Plovdiv (LifeWatch Bulgaria).

Finally, 11 monthly meetings of the **Training Working Group** have been held over the year, enhancing the coordination of efforts among the National Distributed Centres.



The white-veined hardy Dutchman's pipe (*Aristolochia fimbriata*.).
Picture taken in the Experimental Botanic Garden Region Lombardia, in Toscolano Maderno, Italy.
Photo by Andrea Moro (License: https://creativecommons.org/licenses/by-sa/4.0/), original: https://dryades.units.it/dryades/plants/foto/TS246376.jpg

LifeWatch ERIC

Industrialisation, Technology Transfer and Innovation

A sound Industrialisation process is a prerequisite for the integration of LifeWatch ERIC Research and Innovation resources into the marketplace and for forging collaboration with the relevant public and private sector actors, including the industry, by supporting knowledge and technology transfer mechanisms. In 2024, various components were included in the industrial line, such as **cloud services**. Some of these services were made available to LifeWatch Spain and LifeWatch Greece. Additionally, **new analytical services** and functions were produced, following dedicated efforts from scientific and engineering personnel, such as the new features of LifeWatch Search service. In addition, LifeWatch ERIC delivered the **first design of the Technology Transfer and Innovation Strategy**, as part of the Business Plan.

Stakeholder Commitment and Financial Sustainability

Ensuring the **long-term sustainability and operational excellence** of LifeWatch ERIC requires a financial model that extends beyond national member contributions. The infrastructure operates through a **diversified funding strategy**, combining public investment with competitive research grants and innovation-driven opportunities.

1. Strategic Public Investment by Member States

LifeWatch ERIC's financial foundation rests on sustained contributions from its Member States, structured as follows:

- **Cash Contributions (15%)**: These amount to €2 million annually, allocated to the core functions of LifeWatch ERIC's **Common Facilities**. They cover construction, maintenance and operational costs.
- **In-Kind Contributions (85%)**: Dedicated to the **development and maintenance of research resources**, community engagement, and essential support functions across national nodes.

Member States commit these resources over **a renewable five-year period**, reaffirming their shared responsibility in maintaining Europe's leading infrastructure for biodiversity and ecosystem research. LifeWatch ERIC's core strategy is to **preserve existing commitments while expanding membership**, ensuring that new countries can join under a shared long-term vision. An **Expanding Membership Strategy** is actively in implementation.

2. National and European Grant Funding

LifeWatch ERIC secures additional financial support through:

- **National Programmes**: Targeted grants from country-level research and infrastructure funding schemes.
- **European Research and Innovation Framework Programmes**: LifeWatch ERIC's participation in Horizon Europe and related EU projects continues to grow, reaching 28 active projects in 2024, contributing over €2 million annually in additional funding. This reflects strong alignment with EU research priorities and LifeWatch ERIC's recognised leadership in biodiversity and environmental science.

3. Innovation, Technology Transfer, and Private Sector Engagement

Recognising the importance of leveraging its technological assets for broader societal and economic impact, LifeWatch ERIC launched in 2024 the development of its T**echnology Transfer and Innovation Strategy (TTIS)**, a cornerstone of its current **Strategic Working Plan (SWP)** and a key enabler of financial diversification. The fully developed TTIS will be included in LifeWatch ERIC's **Business Plan** (currently under development).

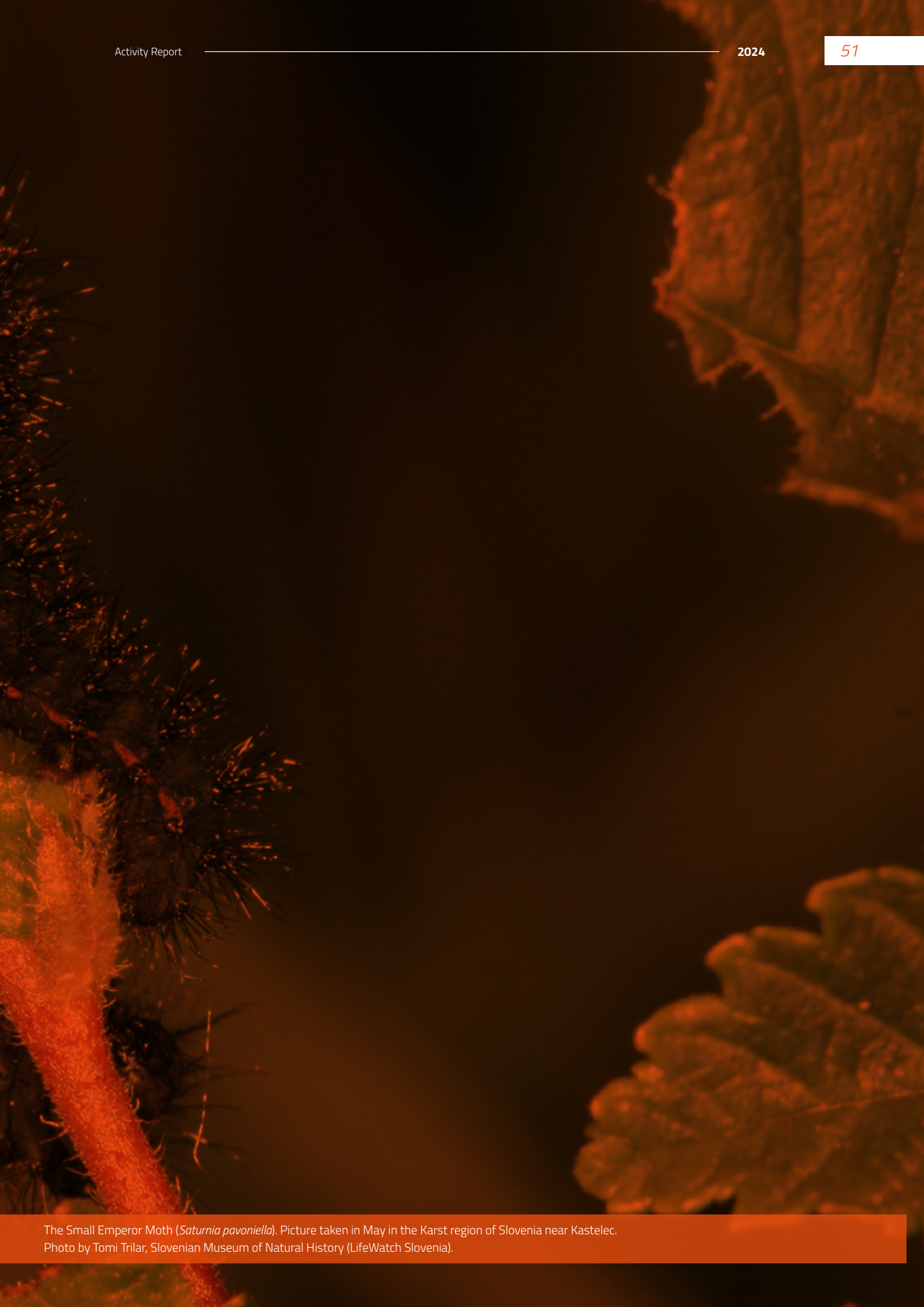
Key actions under the TTIS include:

- **Technical Readiness Level (TRL) Assessment**: A structured review of LifeWatch ERIC's technological portfolio to identify high-potential innovations suitable for **private sector collaboration**.
- **Business Plan and Market Analysis**: Currently underway, this includes scoping of market demand, identification of strategic partners, and evaluation of commercial applications.
- **Capacity Building for Industry Engagement**: LifeWatch ERIC is contributing to the development of a **new generation of researchers and professionals** equipped to work at the science-industry interface.

4. Unlocking Commercial Potential

LifeWatch ERIC's **TTIS** targets both **technology transfer and commercialisation**, aiming to open **new revenue streams** while strengthening Europe's innovation ecosystem. As part of this effort:

- LifeWatch ERIC will offer **access to its technologies** to businesses and industry, improving competitiveness and accelerating green and digital innovation.
- Partnerships are being pursued with **industry stakeholders, venture capitalists, and government agencies** to bring promising technologies to market.
- **Two licensing discussions are currently in progress** with Spanish industrial operators for the commercialisation of:
  - **A LifeWatch ERIC-developed data logger** designed for remote ecological monitoring,
  - And **LifeBlock**, a blockchain-based tool developed by LifeWatch ERIC to enhance data transparency and traceability in biodiversity science.



The Small Emperor Moth (*Saturnia pavoniella*). Picture taken in May in the Karst region of Slovenia near Kastelec.
Photo by Tomi Trilar, Slovenian Museum of Natural History (LifeWatch Slovenia).

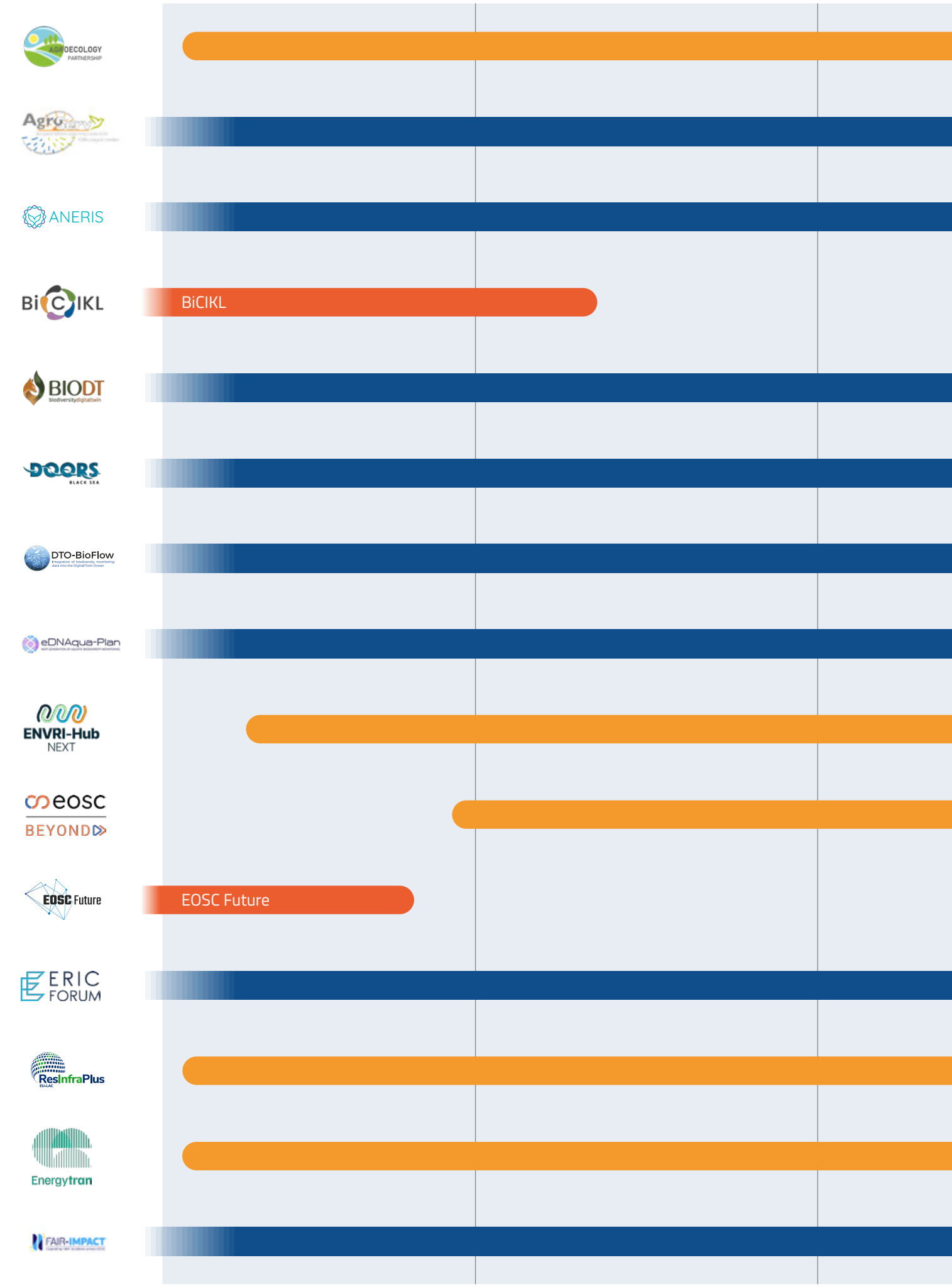
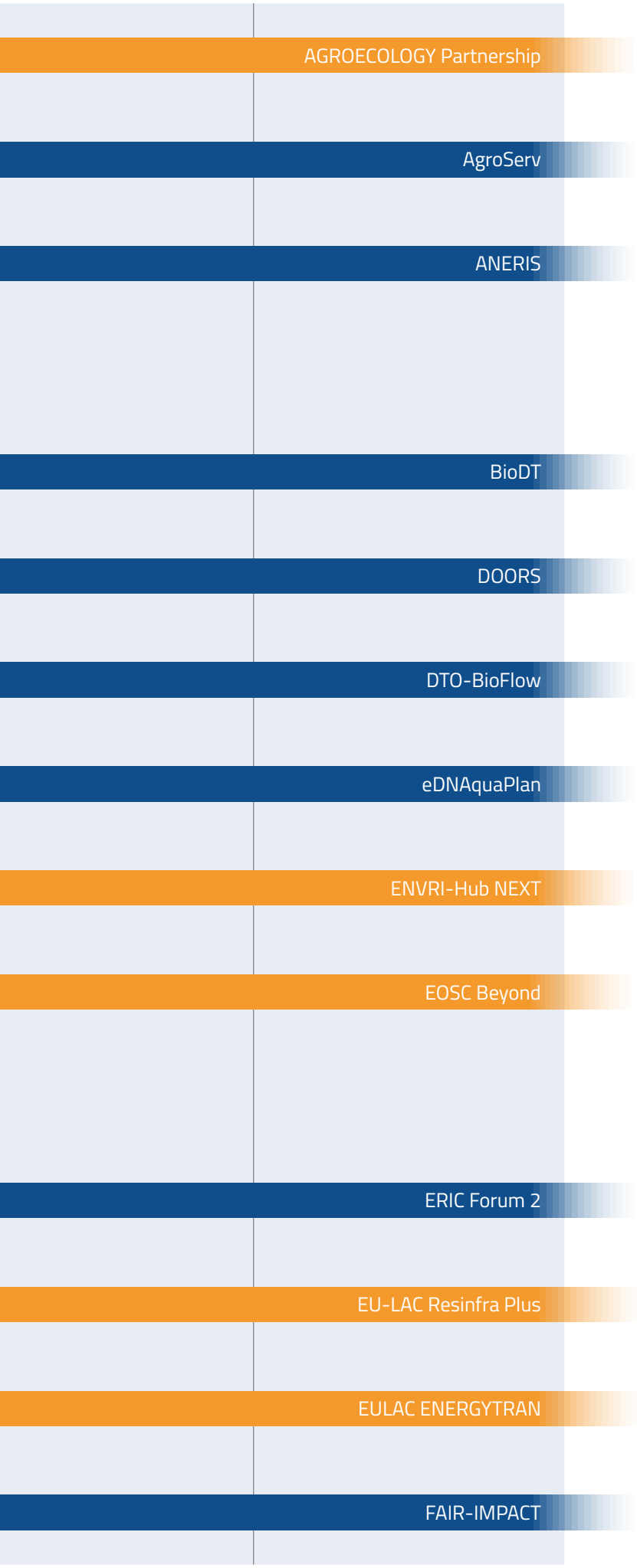


Figure 5. Overview of European Projects first part



Horizon 2020 and Horizon Europe Projects

In 2024, LifeWatch ERIC had been involved in **28 European Projects**. Ten new projects were awarded to LifeWatch ERIC and kicked-off during the year: **EULAC ENERGYTRAN**, **EU-LAC ResInfra Plus**, which focus in Research Infrastrutures; **OSCARS**, **OSTrails**, **EOSC Beyond** and **ENVRI-Hub NEXT**, contributing to our portfolio with Technical Alliances; and **StEPPFoS**, **MICROBES-4-CLIMATE**, **AGROECOLOGY Partnership** and **SUS-SOIL** which focus on Terrestrial Ecosystems.

- Projects ongoing in 2024
- Projects started in 2024
- Projects closed in 2024

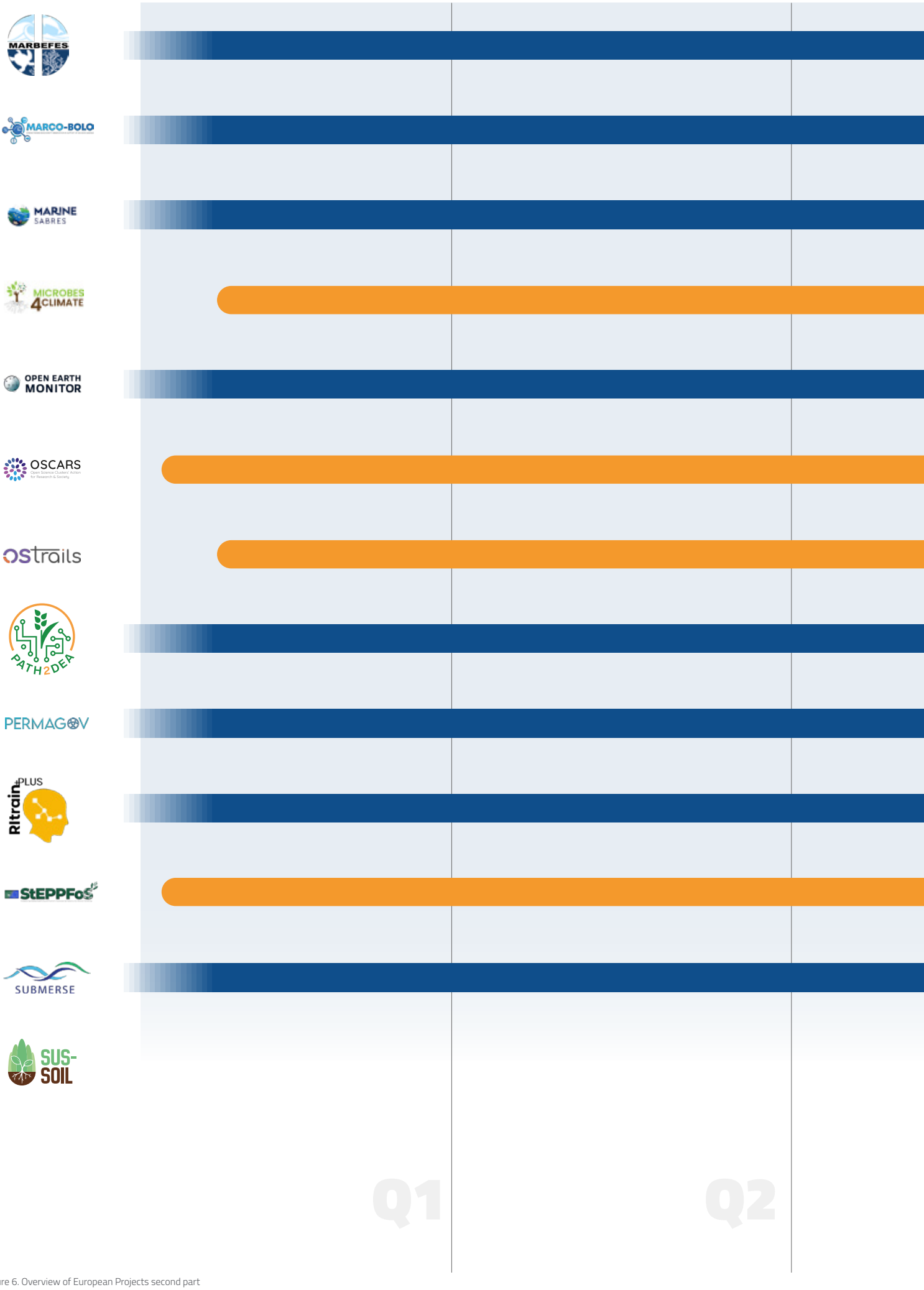
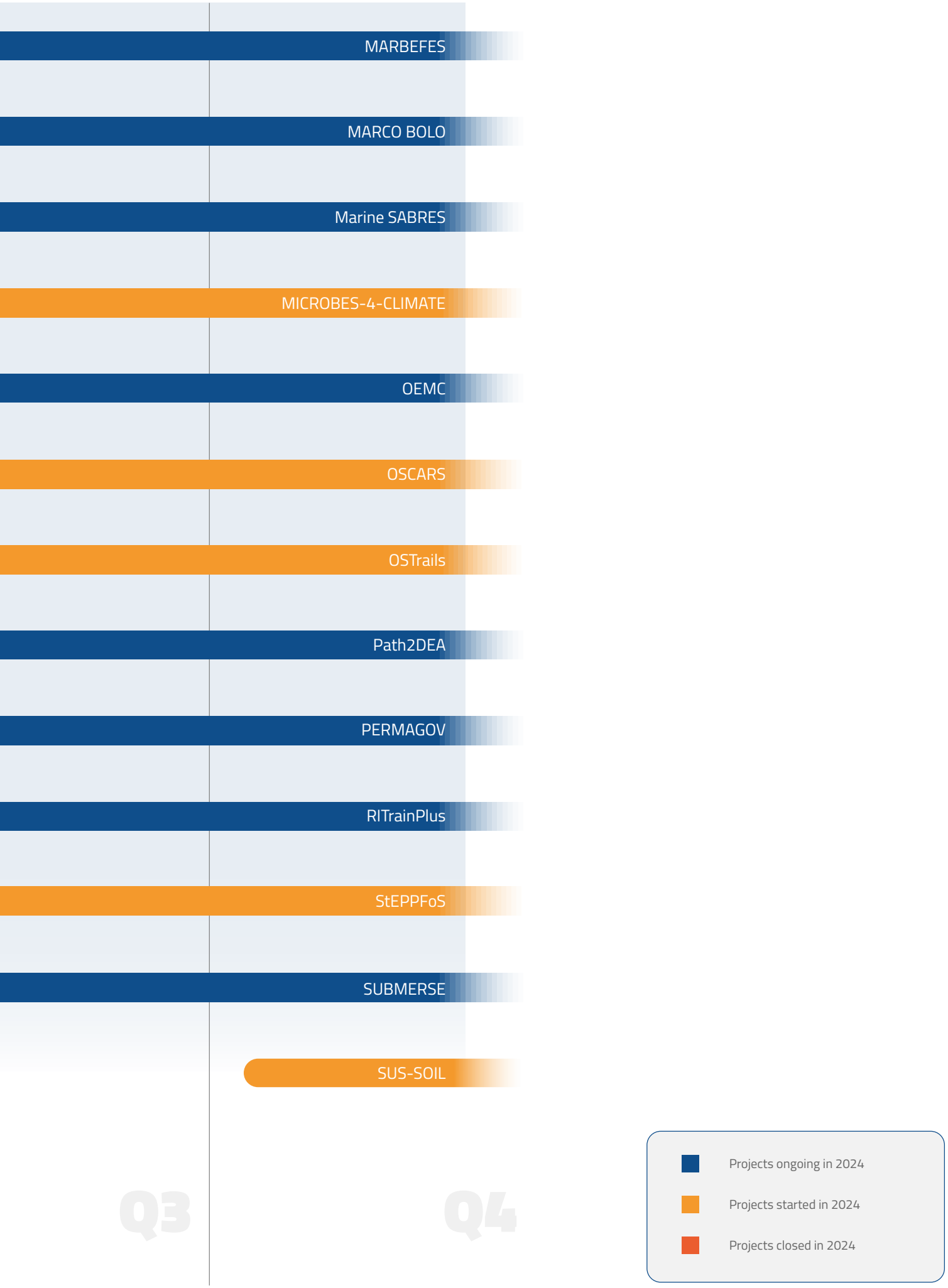


Figure 6. Overview of European Projects second part


MARBEFES
MARCO BOLO
Marine SABRES
MICROBES-4-CLIMATE
OEMC
OSCARS
OSTrails
Path2DEA
PERMAGOV
RITrainPlus
StEPPFoS
SUBMERSE
SUS-SOIL
Q3
Q4
Projects ongoing in 2024
Projects started in 2024
Projects closed in 2024

Key Performance Indicators

Strategic Objective 1

To industrialise and support the knowledge & technology transfer mechanisms of the existing prototype LifeWatch ERIC Research Infrastructure at all levels: scientific, technical, communication, innovation, administrative and financial (from current Technology Readiness Level (TRL) 6 to TRL 9).

KPI 1.a: Number of users per VRE

Number of downloads/studies or provisions of services. *Expected performance: On average, 30-50 users per year per VRE.*

Workflow executed: **3,779**

Users per VRE: **159**

KPI 1.b: Number of user requests for access

Requests for access as a function of new resources published and operated by LifeWatch ERIC per year. *Expected performance: Hundreds of users requesting access to 30-50 new resources per year.*

Registered users: **2,410** *(810 in 2024)*

Users per VRE: **25,613** *(10,497 in 2024)*

Sessions: **44,139** *(23,889 in 2024)*

KPI 1.c: Number of new projects and private sector partners involved in co-construction processes and percentage of revenues from contracts, economic activities in the annual accounts

Any kind of economic activities: Projects, Private Sector and Industry related services provision, common capital ventures, etc. *Expected performance: As much as 20% of the total in-cash investment on a yearly basis, with an average of 2 new activities and 5 new partners per year.*

10 new partners, collaborating with LifeWatch ERIC in the framework of projects, in 2024. *In 2024, **52**% of the total budget of the ERIC came from projects.*

Revenues (private sector): 0, TTIS in development

Strategic Objective 2

To consolidate and broaden LifeWatch ERIC e-Infrastructure towards the integration of all content, services and other assets (e.g. installations, hardware, software, observatories), currently existing in the member states and the new ones, into a single RI which offers an open, creative and democratic space to the users.

KPI 2.a: Number of resources managed and operated by LifeWatch ERIC (installations, hardware, software, observatories)

Web services available on LifeWatch ERIC web portal, which are fully operational. *Expected performance: On average, 30-50 new services per year, accessed by hundreds of users.*

Total: **197** web services *(in 2024, **10** new web services and **179** upgraded components)*

KPI 2.b: Number of publicly available datasets (% of FAIR-compliant data)

Number of FAIR datasets produced as a percentage of the total number of datasets produced. *Expected performance: On a yearly basis, 30-50 new datasets accessed by hundreds of users.*

Total: **1,521** datasets, **98.36%** of them are FAIR compliant *(in 2024, **104** new datasets)*

Strategic Objective 3

To advance scientific and technological innovation, based on the continuous improvement in the performance of the VREs, by investing in emerging technologies with profound application in Biodiversity and Ecosystem Research (BER), towards the next generation Infrastructure on Biodiversity and Ecosystem Research (next-gen IBER).

KPI 3: Publication

Number of publications based on the research performed using concepts/facilities/resources, etc. of LifeWatch ERIC.
Expected performance: 30-50 new publications per year.

Total number of publications: **535** Publications in 2024: **209**[2], out of which **67** peer-reviewed; **13** of which in the first quartile of the most impactful journals on the scientific field

Strategic Objective 4

To deepen the engagement of the scientific communities (with attention to inclusivity and equity), biodiversity and ecological observatories, stakeholders and citizens, at global scale.

KPI 4.a: Engagement achieved by direct contact (e.g. events, booths, etc.)

Outreach by public relations/direct contact with specific target groups: organisation of (e.g. summer schools, etc.) or participation to events organised by third parties.
Expected performance: On average, 100-200 persons per year engaged through the above events.

In 2024

- Totally, **1,151** persons engaged
- **536** persons engaged in LifeWatch ERIC own events
- **615** persons engaged in events organised by others

KPI 4.b: Outreach through media and LifeWatch ERIC own web and social media activities

Impact of press and communication actions in raising awareness of LifeWatch ERIC mission, activities and societal relevance of results:

1. Mentions on media
2. Website analytics
3. Social media analytics
4. Newsletter analytics.

Expected performance: Thousands of people reached through the above activities, yearly.

In 2024

1. Media mentions: **62**
2. **www.lifewatch.eu** (Users: **25,373**, Page views: **91,706**)
3. Social Media (New Followers: **5,753**, Reach: **164,382**)
4. Newsletter (Total number of subscribers: **814**, New subscribers in 2024: **250**, Open rate: **37,5%**)

KPI 4.c: Participation to policy related events

Number of participation cases in policy related events, working groups, committees & advisory boards.
Expected performance: On average, participation of LifeWatch ERIC in at least 10 such events per year.

In 2024: **39** events

Strategic Objective 5

To forge collaboration with the public, private sector and industry to guarantee sustainability of the innovation produced and to address aspects of the EU Green Deal, EU Biodiversity 2030 and EU Digitisation and Innovation plans.

KPI 5: Projects (EU, national and regional) with which LifeWatch ERIC collaborates

Number of projects funded by means external to LifeWatch ERIC and total budget as project income for LifeWatch ERIC.
Expected performance: On average, participation in 2 new projects per year with a total sum for LifeWatch ERIC of 150,000 €

In 2024:
10 new European projects

2 https://scholar.google.com/scholar?as_vis=1&q=lifewatch+eric&hl=it&as_sdt=0,5&as_ylo=2024&as_yhi=2024

National Distributed Centres
LifeWatch Belgium

Belgium joined LifeWatch ERIC in 2017 and it contributes through its National Distributed Centre. Notwithstanding its relatively small territory, Belgium has a remarkable diversity of habitats and species, and has a rich tradition of biodiversity and ecosystem research, both within and outside of its borders. Since the start of LifeWatch ERIC, Belgium has actively contributed through a number of long-term projects managed by different research centers and universities across the country and supported by the respective political authorities.

The Belgian Distributed Centre has continued the development and operation of:

- **Species information Backbone for LifeWatch ERIC (VLIZ):** a central LifeWatch ERIC service that facilitates the standardisation and integration of species data and provides access to information on species taxonomy, biogeography, genetics, traits (habitat, morphology, vulnerability, etc.) and literature.
- **Regional node - Marine, terrestrial and freshwater biodiversity observatories (VLIZ&INBO):** Integrated observation systems that generate long-term and openly accessible biodiversity data applying innovative approaches (imaging, acoustics, genomics, tagging and tracking, artificial intelligence, citizen science).
- **Facility for thematic biodiversity and habitat mapping from remote sensing and species distribution modelling (UCLouvain & ULiège)**: an interactive geoportal providing thematic pan-European remote sensing data. An object-based geographic data integrating the commonly used biodiversity variables is distributed for Belgium (ecotopes) and Europe (ecopatches). Moreover, biophysical variables are available for the South Pole.

Over 2024, LifeWatch Belgium achieved:

- Continuous **growth** in **volume** and **usage** of the major **data systems** and **biodiversity data series**.
- Launch of the **new LifeWatch Belgium Website**.
- Recognition for key components in international frameworks. For example, the endorsement of **WoRMS, Marine Regions, ETN in the UN Ocean Decade**; role of **WoRMS, Marine Regions in the joint OBIS-GBIF Action Plan for Marine Biodiversity Data**; the usage of the **data series in the reporting for the Marine Strategy Framework Directive and the Convention for the Protection of the Marine Environment of the North-East Atlantic** (OSPAR).
- Exploitation of the services in numerous scientific studies and publications. **Components** of the Belgian infrastructure were **cited in over 1,250 publications in 2024** and several local doctoral studies were supported.
- Valorisation of the services and expertise through involvement in **many EU projects**. For example, within the Horizon Europe DTO-Bioflow project, coordinated by VLIZ, the developed sensor data pipelines from the LifeWatch Belgium biodiversity observatory are being upscaled in a broader European context to deliver data to the EU Digital Twin of the Ocean. Other examples are: MARBEFES, MARCO-BOLO, Marine SABRES, ANERIS, BiOcean5D, GES4SEAS, BIG_PICTURE, and HiRAD.

Fagnes, Belgium. Photo by Adrien Delforge on Unsplash.

National Distributed Centres
LifeWatch Bulgaria

Bulgaria joined LifeWatch ERIC in 2022, contributing through a consortium of 14 national scientific and educational institutions specialising in biodiversity and agroecology. The Agricultural University-Plovdiv is the scientific coordinator of the Distributed Centre and represents Bulgaria in LifeWatch ERIC.

LifeWatch Bulgaria performs activities in the following thematic areas:

- Plant Health Infrastructure activities,
- Research, involving laboratory and field testing and assessment,
- Analysis and assessment of the impact of agricultural practices on biodiversity,
- Analysis of ecosystem services and agroecology,
- Advanced agrobiodiversity monitoring,
- Analysing and assessing the environmental pressures,
- Implementation of the 'multi-actor approach' engaging key stakeholders and experts for an open-source collaboration.

During 2024, the Bulgarian Node supported LifeWatch ERIC through:

- Participation in **International** and **National Events**: **International Bird Day**, **World Environment Day**, **Second Plovdiv Science Festival**, **Living Exhibition - Young Blue Earth Festival**, **20th Rhododendron Festival**.
- Conception and organisation of "**Living Exhibition**", including live-size models of different world known endangered birds, observed in different parts of Bulgaria. This exhibition aims at raising awareness on vulnerable wildlife, among which the Lesser Kestrel, and served as an educational platform.
- Participation in the **LifeWatch ERIC's working groups' activities**:
  - LifeWatch Bulgaria's leading Partner – Agricultural University, Plovdiv – participated in the LifeWatch ERIC working groups on Training and Communications.
  - Agricultural University of Plovdiv participated in the working group on the Intellectual Property Rights Policy of LifeWatch ERIC.
  - The representative from LifeWatch Bulgaria chaired the In-kind Contribution Committee of LifeWatch ERIC.
- **Participation to LifeWatch ERIC projects**. The Bulgarian Consortium Partner, Green Balkans, has signed an in-kind contribution against payment agreement to carry out Task 4.4 - Preparation of marine/terrestrial biodiversity and landscape diversity *in-situ* data, of the Horizon Europe project Open-Earth-Monitor Cyberinfrastructure (OEMC).
- The partner, the Bulgarian Society for the Protection of Birds and the Association "Green Balkans – Stara Zagora", participated in the **LifeWatching TV Science channel**.
- Representatives of LifeWatch Bulgaria were actively participating in different ongoing **workshops, meetings and events organised by LifeWatch ERIC**.

View of a mountain range in Bulgaria. Photo by Grigoriya Nikolova on Unsplash.

National Distributed Centres
LifeWatch Greece

Greece joined LifeWatch ERIC in 2017 and fulfils the vision to establish the Biodiversity Centre of Excellence for South-eastern Europe, by: (a) Allying all the Greek scientific human potential working on biodiversity data and data observatories; (b) Paving the way for the development of complex virtual domains through a number of background e-Services; (c) Developing a number of virtual labs (vLabs) as a contribution to LifeWatch ERIC; (d) Building capacity at the national level through a network of activities; (e) Disseminating information, scientific knowledge and expertise to the public. The Greek National Distributed Centre is funded by the Greek General Secretariat of Research and Innovation and is coordinated by the Institute of Marine Biology, Biotechnology and Aquaculture of the Hellenic Centre for Marine Research (HCMR).

The Greek Distributed Centre has supported LifeWatch ERIC through:

- **Advancement of the microCTvLab**. A new collection of microCT data has been developed and uploaded in the microCTvlab. Specifically, 60 annelid specimens have been scanned by the microCTvlab and used as models for the creation of bioinspired shape-morphing robots within the framework of MAPWORMS project. Furthermore, new metadata fields have been added (e.g. project info, citation, funding, Dataset URL). A microCT mobile application (**http://microctapp.hcmr.gr/**) also developed in the framework of MAPWORMS project in order to disseminate the microCT annelid scans.
- **Enforcement of medOBISvLab**. The medOBIS virtual laboratory (vLab) has reached further advancements, and now features an ongoing data flow into medOBIS database of both historical and new datasets and an updated Integrated Publishing Toolkit. Currently, medOBIS hosts 78 FAIR datasets. Moreover, on February 12th 2024, an MBON Europe & LifeWatch ERIC hands-on workshop took place in Bologna, which enhanced understanding and application of FAIR principles in marine biodiversity data. Active participation from 8 individuals representing diverse datasets showcased significant progress in understanding and implementing the discussed principles. The workshop had a total of 15 participants, who gained valuable insights and made strides toward independent data publication.
- **Development of organic links and dependencies between Common Facilities and national Distributed Centres**. The integration of LifeWatch Greece portal in the central Authentication and Authorisation Infrastructure - AAI of LifeWatch ERIC has been initiated.
- **Participation in the Internal Joint Initiative workflow development for the analysis of Autonomous Reef Monitoring Structures (ARMS) data.** LifeWatch Greece has been actively participating in building a Virtual Research Environment (VRE) for the analysis of both community composition and community metabarcoding data from Autonomous Reef Monitoring Structures (ARMS). Informaticians at the ICT-Core in Spain, LifeWatch Greece and LifeWatch Belgium continued to work on the ARMS case to build a data-analysis workflow to process raw genetic data from the ARMS-MBON network using the PEMA bioinformatic pipeline. ARMS-MBON has now become part of the European Marine Omics Biodiversity Observation Network (EMO BON), a larger European initiative for the observation of genomic biodiversity.
- **Communication activities.** The activities of LifeWatch Greece were presented with one poster and two presentations during the 5th International Congress on Applied Ichthyology, Oceanography, and Aquatic Environment (HydroMediT 2024) that took place in Mytilene, from the 30th of May to the 2nd of June 2024, in the premises of the University of the Aegean. The poster entitled "EMODNET BIOLOGY: An EU Service available for the Mediterranean Region" and the oral presentations entitled "Application of FAIR Principles to Micro-CT Data in the MAPWORMS Project" and "Citizen Science Platforms Facilitate the Rescue and Standardisation Process for Historical Marine Biodiversity Data".

Coastal sand ripples in Greece. Photo by Giorgos Chatzigeorgiou of Hellenic Centre for Marine Research (HCMR), LifeWatch Greece.

National Distributed Centres
LifeWatch Italy

Italy joined LifeWatch ERIC in 2017 and hosts its Service Centre. LifeWatch ERIC has always been strongly supported by the national scientific community, as well as regional and national institutions, as Italy is a biodiversity hotspot in Europe. Italian landscapes and protected areas are natural laboratories for biodiversity and ecosystem research. The LifeWatch Italy web portal provides a networking interface for the biodiversity and ecosystem community, offers learning and training opportunities, the metadata catalogue, semantic resources and data, ICT services & VREs, supporting research activities and evidence-based policymaking.

During 2024, the National Distributed Centres of LifeWatch ERIC significantly increased the LifeWatch Italy offer of data and services, thanks to the consolidation and enrichment of the new platforms released in 2023:

- **DataLabs** is a platform for creating collaborative code to analyse biodiversity and ecosystem data. The platform allows users to create and publish scripts in R, Python and MATLAB, develop web services and structured web interfaces for services. At present, the platform counts 128 active projects.
- The **Metadata Catalogue** enables discovery and access to diverse resources from a variety of providers through descriptive metadata, improving and promoting the exchange and sharing of information. At present, the catalogue counts 128 resources including datasets, audio, services and VREs.
- The **Data Portal** is the Italian HUB of biodiversity and ecosystem research data, customised to provide complete data management from data curation and validation to research and publication. The workflow for data curation and validation has been improved to provide a better user experience. The Data Portal hosts two subportals dedicated to LifeWatch Italy's scientific community projects and 68 datasets.
- The **Italian Taxonomic Backbone** gathers nomenclatural and distributional data on Italian biodiversity from three checklists provided by Italian taxonomists: fauna checklist (about 26,000 animal taxa), flora checklist (about 11,000 plant infraspecific taxa) and lichens checklist (about 3,500 lichen infraspecific taxa).
- The **Virtual Museum** is a collaborative education platform offering visits to rooms which provide a 360-degree experience of different ecosystems. The Virtual Museum has been enriched with new contents including images, videos, interviews, and educational games.
- The **Bioacoustics Platform** is aimed at the recognition of species that are difficult to directly observe because they are very rare, have nocturnal habits, or are strongly camouflaged species, but can be identified through the emission of sounds. Currently, the platform recognises about 60 bird species and has about 80 recorded entries.

Moreover, LifeWatch Italy participated to LifeWatch ERIC working groups on Communication and Training, and undertook own initiatives **engaging over 1,245 persons in events** and reaching **over 50,000 views on its website**. The **Multimedia Production Centre** continued its work in powering **LifeWatching.TV**.

Thapsia garganica L. Picture taken in Alta Murgia National Park – Apulia, Italy. Photo by Fabrizio Bartolucci (License: https://creativecommons.org/licenses/by-sa/4.0/), original: https://dryades.units.it/dryades/plants/foto/4975911091023364561239551263877194441470983333njpg1748783180.jpg

National Distributed Centres
LifeWatch Netherlands

The Netherlands joined LifeWatch ERIC in 2017 and hosts its Virtual Laboratories and Innovations Centre (VLIC) Common Facility. The University of Amsterdam (UvA), is the leading institution of the Dutch National Distributed Centre. The Common Facility LifeWatch ERIC VLIC is hosted by the Faculty of Science of UvA.

The main Research Infrastructure development programmes in The Netherlands are the **ARISE project** and the **LTER-Life project**. Both projects have a 10 year funding budget to construct research infrastructure for biodiversity monitoring and building digital twins of natural areas for analysis, scientific research and nature conservation.

Main activities in 2024 in LTER-Life project are:

Achievements

- **protoDTs**: workflows to explore, test and expand VRE & VL capabilities
  - Veluwe budburst protoDT (linking data from different sources, using R in NaaVRE, LifeWatch ERIC),
  - Waddensea NPP protoDT (linking data incl. large size Satellite imagery, R-package inclusion in NaaVRE, spatio-temporal interpolation, LifeWatch ERIC),
  - Setup PCLake testbed environment (to be applied in 2025 – running dynamic model in classroom setting).
- **Hands-on guide to FAIR and structured ecological data**: developed step-by-step guide, including an evaluation tool that provides targeted pointers to chapters in the guide based on the status of a dataset (lter-life-experience.org).

Work in progress

- **Catalogue for metadata**,
- Selection of **minimum metadataset** (not yet operational).

Main activities in ARISE in 2024 are:

- Setting-up and maintaining a **network with automatic camera traps for biodiversity monitoring** in three sites: the Amsterdamse Waterleiding Duinen ('Amsterdam Water Supply Dunes'), national park de Hoge Veluwe & the Oostvaardersplassen,
- **Field comparison of various automatic insect-monitoring devices and bird nest monitors** to enhance insect monitoring
- **Evaluating the effectivity of acoustic** recorders for biodiversity monitoring,
- Maintaining the **monitoring of bird movement data** (species diversity and phenology) through a dedicated bird-radar (Birdscan) in Artis Zoo,
- **Maintaining the demonstration site in Artis Zoo**, where functional equipment from the various field sits is on display for the general public,
- Building and using a **web-portal** where the **field data can be screened and annotated**.

NaaVRE (Notebook-as-a-Virtual Research Environment) developed by LifeWatch ERIC VLIC together with UvA has been deployed and operational on the LifeWatch ERIC infrastructure. Main activities in 2024 with regard to the co-creation process in NaaVRE between UvA and VLIC are:

- Further development of the **Vol2Bird VL,**
- Contributions by the **Multiscale Networked Systems group for NaaVRE** infrastructure software components.

The University of Amsterdam collaborates with LifeWatch ERIC in several European projects related to the ENVRI community. Most notably are the contributions to **ENVRI-Hub NEXT**, **EVERSE** and **OSCARS**. All projects deliver increased functionality for collaboration among research infrastructures in Europe.

A view of the lake in Braies, Italy. Photo by Luca Bravo on Unsplash.

National Distributed Centres
LifeWatch Portugal

LifeWatch Portugal joined LifeWatch ERIC in 2019 and contributes through its National Distributed Centre. LifeWatch Portugal (PT) is managed at the national level by **e-I PORBIOTA** – the Portuguese e-Infrastructure for Information and Research on Biodiversity, led by **BIOPOLIS Association/CIBIO-InBIO** – the Research Centre in Biodiversity and Genetic Resources, Associated Laboratory. The e-I PORBIOTA was included in the first Portuguese Roadmap for Research Infrastructures of strategic relevance (RNIE) in 2014. This entity stores, organises and disseminates biodiversity and ecosystem data, making it available to the scientific community and society and contributes to promoting integrative taxonomy and building up knowledge of national biodiversity. It encourages progress in highly competitive cutting-edge areas, such as metabarcoding and environmental metagenomics. The e-I PORBIOTA also contributes significantly to the advancement of scientific knowledge in biodiversity, ecosystem functions, and ecosystem services by supporting the digitisation, aggregation, and dissemination of data on biodiversity and Portuguese ecosystems, as well as increasing the international impact of national research in these fields. LifeWatch PT, through e-I PORBIOTA, provides access to a wide range of biodiversity-related services, including biodiversity and environmental data resources, as well as computational and analytical tools for study, policy implementation, and assessment. During 2024, LifeWatch Portugal activities were:

- **Open Earth Monitor Cyberinfrastructure (OEMC)** - LifeWatch Portugal contributed with the preparation of marine/terrestrial biodiversity and landscape diversity *in-situ* data. Occurrence and percentage cover of intertidal macrospecies (molluscs, crustaceans, echinoderms, algae, etc) at ~25 locations across the Atlantic coast of Europe, from Scotland to Morocco. LifeWatch Portugal has published a dataset formatted in DarwinCore from fieldwork expeditions conducted between 2022 and 2023 to collect biodiversity from rocky intertidal zones along the North Atlantic coast, stretching from Scotland to Morocco. This open-access dataset contains 16,258 occurrence records of macro-algae and invertebrates. **http://ipt.gbif.pt/ipt/resource?r=intertidal_biodiversity_northatlantic22**
- **Marine Biodiversity and Ecosystem Functioning leading to Ecosystem Services (MARBEFES)** - In the framework of the Task 7.4 of MARBEFES project, LifeWatch Portugal is supporting the LifeWatch ERIC training team in the organisation of Intensive Schools (Activity 7.4.c).
- **Consolidation/mobilisation of data** - Datasets from biodiversity and ecosystem subdomains from Portuguese data providers. Species occurrence/abundance and DNA barcode, abiotic variables and species trophic interactions and dietary metabarcoding datasets. The datasets are available on the LifeWatch ERIC Metadata Catalogue project outputs/participation.

A view of the Praia do Salgado, Portugal. Photo by Maria Korniiova on Unsplash.

National Distributed Centres
LifeWatch Slovenia

Slovenia joined LifeWatch ERIC in 2017 and is one of the National Distributed Centres composing LifeWatch ERIC. It is also included in the Slovenian National Roadmap and in the Strategy for Smart Specialisation (S4) and Horizon 2020. The main highlights of 2024 for the Slovenian Consortium LifeWatch-SI and Distributed Centre were:

- Organisation of the international LifeWatch ERIC **Thematic Service Workshop on Biodiversity Observatory Automation** (Ljubljana, 11/04/2024). The workshop focused on reviewing and updating the requirements for effective biodiversity assessment in the era of environmental change and biodiversity change.
- Organisation of the 5th International **SOS Proteus Conference** (Kranj, 07-08/12/2024) by the Tular Cave Laboratory (a consortium partner), where scientists, researchers and conservationists shared their knowledge and encouraged multidisciplinary international scientific cooperation for *Proteus anguinus* research.
- Participation in numerous **international committees and working groups** of LifeWatch ERIC, and at the international BES Conference (Liverpool, 10-13/12/2024).
- **Engagement in the LifeWatch ERIC related EU project** Open Earth Monitor Cyber Infrastructure (**OEMC**), and involvment in preparing data covering terrestrial and marine biodiversity.
- Development and maintainance of the following databases, which are continuously updated:
  - **BRDbase**: A database of the Slovenian Bird Ringing Centre, managed on the licensed data platform WebGalis,
  - **FOR-PLAT**: A database collecting data from forest terrestrial ecosystems,
  - **ARMS**: A database includes genomic and metagenomic data from the Gulf of Trieste, Vector Graphs, and additional environmental data (SeaDataNet),
  - **FloVegSI**: A database containing over 1.5 million records of floristic, faunistic, and phytosociological data primarily from Slovenia, as well as from Central and Southeastern Europe,
  - **Vegetation of Slovenia**: A database contains all vegetation plots from Slovenia since 1932, mostly recorded using the standard Central European Braun-Blanquet method,
  - **Amphipoda Dataset**: A dataset on the functional traits of European groundwater amphipods (family Niphargidae and Typhlogammaridae),
  - Data from meteorological stations: **Maribor Station**, **Jelševnik Station**, and **VIDA Buoy**,
  - **KARST Database**: a platform for karst multidisciplinary data enabling their integration with various standard schemas and GIS systems (HANDLE, GeoNetwork, QGIS Server, ArcGIS Online), interactive cartographic and graphical displays, and connection to field measurement stations.
- National **Metadata Portal**: A digital repository for selected environmental data, developed on the GeoNetwork platform in alignment with FAIR principles (Findability, Accessibility, Interoperability, and Reusability).
- A **Nextcloud**-based internal data storage system has been established for the LifeWatch Slovenia consortium.
- Development of two virtual laboratories (vLabs): **Karst Groundwater Habitats vLab** and **ProteusWatch vLab**.

Publications with LifeWatch ERIC affiliation are available on the websites **https://www.zrc-sazu.si/en/strani/objave-ri-si-lifewatch** and **www.lifewatch.si**.

View from Vremščica (Mount St. Urban; 1,027 m above sea level) towards the Reka Valley and the Brkini Mountains.
Photo by Samo Šturm, Škocjan Caves Public Service Institute (LifeWatch Slovenia).

National Distributed Centres
LifeWatch Spain

Spain joined LifeWatch ERIC in 2017 and hosts its Statutory Seat and the ICT Core Offices, assisting in the day-to-day coordination and management of LifeWatch ERIC and the development and operation of the core and horizontal services, correspondingly. LifeWatch Spain Distributed Centre is currently supported by the Ministry of Science, Innovation and Universities, the Regional Government of Andalusia and the Guadalquivir River Basin Authority (Ministry for Ecological Transition-MITECO).

With its large territory, between the Mediterranean Sea and the Atlantic coast, Spain has an enormous diversity of habitats species and genes, including some of the most important natural reserves and parks in Europe (Doñana, Monfrague, Timanfaya), from the white mountains in Sierra Nevada and the Pyrenees to the volcanoes in Tenerife.

In 2024, the Spanish Distributed Centre carried out the following activities:

- **Maintenance of the ERDF projects**: SmartFood, SUMHAL, Indalo, SmartEcoMountains, EnBic2Lab and Alboran,
- **Continuos Data Integration from ALBORAN sensors**,
- **Participation in European projects**: OSCARS, OSTrails, BioDT, MARBEFES, Marine SABRES, EOSC Beyond, Miocrobes4Climate, PATH2DEA, SUS-SOIL, StEPPFoS, DTO-BioFlow, Marco-Bolo, EU-LAC ResInfra Plus, EULAC-ENERGYTRAN, ANERIS, PERMAGOV, FAIR-IMPACT, RItrain Plus, AGROECOLOGY Partnership, AgroServ,
- **Participation to new project proposals**: BiCKL+, BMD.

The above activities contributed to the consolidation of the technical Infrastructure of LifeWatch ERIC, with new components, including HPC resources and data centres (e.g., the e-Biodiversity Research International Centre, e-BRIC, in Matalascañas-Doñana). They also supported the upgrade of **my.lifewatch.eu**, and the completion of the blockchain-based Science Knowledge Graph (SKG) system, LifeBlock.

A view of the Sierra Calderona Natural Park, Spain. Photo by Tim Christopher Klonk on Unsplash.

Acknowledgements

LifeWatch ERIC is grateful to its members and representing entities for their support of its operations and achievements:

The Eurasian Jay (*Garrulus glandarius*).
Picture taken in the hand during the autumn bird ringing at the permanent bird-ringing station near Vrhnika, central Slovenia.
Photo by Tomi Trilar, Slovenian Museum of Natural History (LifeWatch Slovenia).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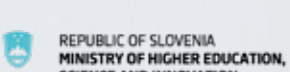
REPUBLIC OF SLOVENIA
MINISTRY OF HIGHER EDUCATION,
SCIENCE AND INNOVATION


Junta de Andalucía
Consejería de Agricultura,
Pesca, Ganadería y Desarrollo Sostenible
Consejería de Transformación Económica,
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Annex
Financial Statements

Balance Sheet

ASSETS	2024	2023
Non-current assets	**153,726.86**	**216,123.78**
Intangible assets	-	-
Tangible assets	65,647.27	137,534.44
Non-current investments	88,079.59	78,589.34
Current assets	**5,049,239.75**	**7,559,374.91**
Inventories	**335,860.41**	**151,414.54**
Advances to suppliers	335,860.41	151,414.54
Accounts receivable	**73,895.61**	**2,020,220.88**
Users and other accounts receivables for the Association's own activity	-	670,442.46
Other receivables	73,895.61	1,349,778.42
Current investments	**3,145,482.83**	**2,728,917.77**
Pre-payments for current assets	**25,893.04**	**27,318.11**
Cash and cash equivalents	**1,468,107.86**	**2,631,503.61**
TOTAL ASSETS	**5,202,966.61**	**7,775,498.69**

EQUITY AND LIABILITIES	2024	2023
Equity	**1,219,652.52**	**655,615.89**
Profit/(loss) from previous years and others	663,805.55	2,575,133.18
Profit/(loss) for the period	555,846.97	(1,919,517.29)
TOTAL EQUITY	**1,219,652.52**	**655,615.89**
Non-current liabilities	**3,645,181.33**	**2,308,852.79**
Provisions	93,718.68	103,575.73
Other long-term debts	3,551,462.65	2,205,277.06
Current liabilities	**338,132.76**	**4,811,030.01**
Current payables	**-**	**4,493,876.06**
Debt with financial institutions	-	2,711,225.88
Other financial liabilities	-	1,782,650.18
Trade and other payables	**338,132.76**	**317,153.95**
Other trade payables	108,622.23	44,002.67
Personnel (salaries payable)	7,896.54	5,247.93
Accounts payable to Public Administrations	221,613.99	267,903.35
TOTAL EQUITY AND LIABILITIES	**5,202,966.61**	**7,775,498.69**

PROFIT AND LOSS	2024	2023
Association's own activity income	**4,521,150.10**	**18,288,218.15**
Operating grants taken to income	4,521,150.10	18,288,218.15
Operating expenses	**(4,014,749.34)**	**(19,459,831.62)**
Personnel expenses	(2,860,261.13)	(5,080,271.87)
Other operating expenses	(1,122,660.52)	(14,344,518.48)
Depreciation and amortisation	(31,827.69)	(35,041.27)
Other Results	**(23,884.58)**	**(802,432.50)**
OPERATING PROFIT/(LOSS)	**482,516.18**	**(1,974,045.97)**
Finance income	2,549.56	6,784.53
Finance costs	-	(13,903.38)
Change in fair value of financial instruments	70,781.23	61,647.53
NET FINANCE COST	**73,330.79**	**54,528.68**
CONSOLIDATED PROFIT/(LOSS) BEFORE TAX	**555,846.97**	**(1,919,517.29)**
Income tax	-	-
PROFIT/(LOSS) FOR THE PERIOD	**555,846.97**	**(1,919,517.29)**

Annex
Deliverables

Priority	Task
LifeWatch ERIC as an Organisation	Task 1.1 Upgrade of the Management System
	Task 1.2 Common Facilities (CFs)
	Task 1.4 Development of organic links and dependencies between CFs and DCs
LifeWatch ERIC as an Infrastructure	Task 2.3 LifeWatch ERIC investment in cutting edge technology
	Task 2.4 Thematic Services
LifeWatch ERIC as a Community	Task 3.3 Communication and Networking
	Task 3.4 Outreach
	Task 3.5 Education and Training
Industrialisation, Technology Transfer and Innovation	Task 4.1 Industrialisation planning of the LifeWatch ERIC prototype
	Task 4.2 Technology Transfer and Innovation Strategy (TTIS)

Deliverable	Type*	Due Date	Actual Delivery Date
D1.2 Strategic Working Plan (SWP) Repository	DEM	M08	M08
D1.9 Updated and Automated Management System of LifeWatch ERIC in Operation	DEM	M28	M28
D1.4 Data and other Resources and Products Management Plan (DRPMP)	R	M12	M12
D1.5 Updated Strategies and Policies for Training Strategy	R	M06	M06
D1.5 Updated Strategies and Policies for Communication Strategy	R	M06	M06
D1.10 Annual Report 2022	R	M12	M12
D1.10 Annual Report 2023	R	M24	M24
D2.8 New component on LifeWatch ERIC Infrastructure with cutting-edge technology web services applied on different levels of the biological organisation	DEM	M30	M30
D2.5 Set of upgraded and new Thematic Services available on LifeWatch ERIC Infrastructure	DEM	M24	M36
D3.3 New components on LifeWatch ERIC e-Science Infrastructure developed in collaboration with the communities through LifeWatch ERIC grants, allocated to transnational access	DEM	M30	M30
D4.1 Industrialisation Plan describing the actions to be implemented to support the industrialisation of prototype	R	M08	M08
D4.2 Technology Transfer and Innovation Strategy (TTIS)	R	M20	M20
D4.3 Report on the assessment of transfer methods available for LifeWatch ERIC products and services	R	M24	M24

The Lesser Horseshoe Bat (*Rhinolophus hipposideros*). Picture taken in April during hibernation in the Kevdrc cave on the slopes of Mount Lubnik west of Škofja Loka in central Slovenia. Photo by Tomi Trilar, Slovenian Museum of Natural History (LifeWatch Slovenia).

This report was approved by the LifeWatch ERIC General Assembly in July 2025 and is available on the LifeWatch ERIC website in the Documents section www.lifewatch.eu/official-documents. The limited number of hard copy versions of the 2024 Activity Report is printed on 100% recycled paper.